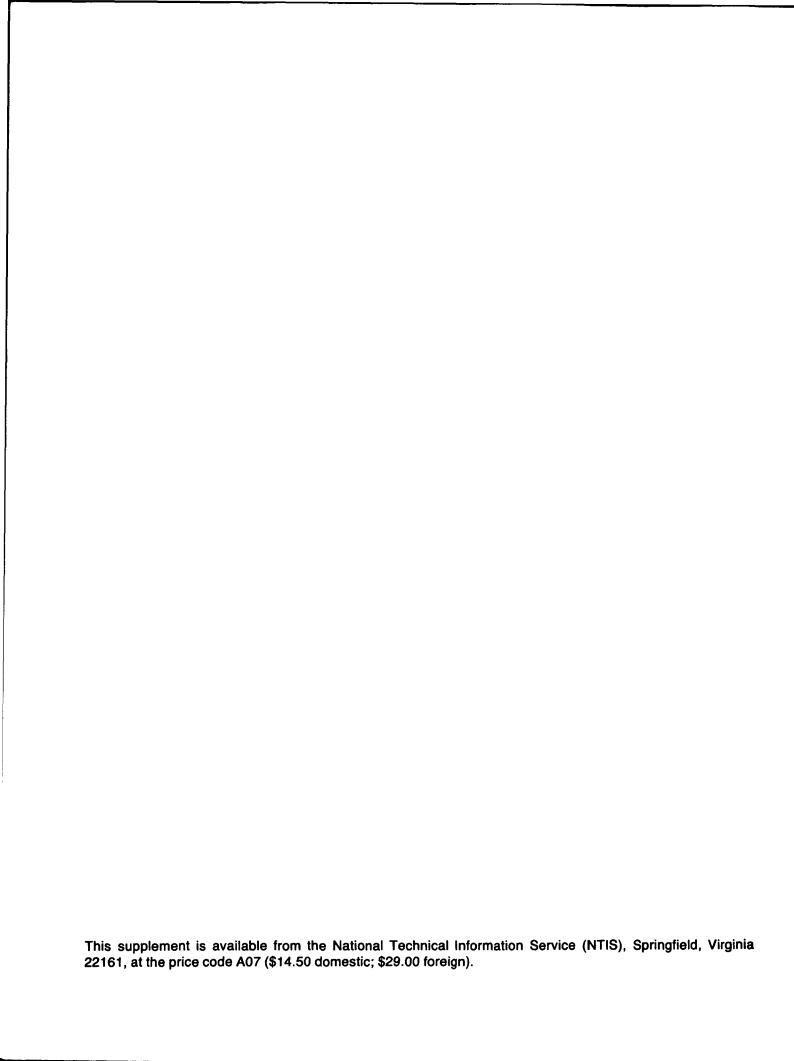
Research
and
echnology

Objectives
and
Plans



SUMMARY

FISCAL YEAR 1983
RESEARCH AND
TECHNOLOGY PROGRAM



INTRODUCTION

This publication represents the NASA research and technology program for FY 1983. It is a compilation of the "Summary" portions of each of the RTOPs (Research and Technology Objectives and Plans) used for management review and control of research currently in progress throughout NASA. The *RTOP Summary* is designed to facilitate communication and coordination among concerned technical personnel in government, in industry, and in universities. We believe also that this publication can help to expedite the technology transfer process.

The RTOP Summary is arranged in five sections. The first section contains citations and abstracts of the RTOPs. Following this section are four indexes: Subject, Technical Monitor, Responsible NASA Organization, and RTOP Number.

The Subject Index is an alphabetical listing of the main subject headings by which the RTOPs have been identified.

The Technical Monitor Index is an alphabetical listing of the names of individuals responsible for the RTOP.

The Responsible NASA Organization Index is an alphabetical listing of the NASA organizations which developed the RTOPs contained in the Journal.

The RTOP Number Index provides a cross-index from the RTOP number assigned by the NASA responsible organization to the corresponding accession number assigned sequentially to the RTOPs in RTOP Summary.

As indicated above, responsible technical monitors are listed on the RTOP summaries. Although personal exchanges of a professional nature are encouraged, your consideration is requested in avoiding excessive contact which might be disruptive to ongoing research and development.

Any comments or suggestions you may have to help us evaluate or improve the effectiveness of the RTOP Summary would be appreciated. These should be forwarded to:

National Aeronautics and Space Administration Office of Aeronautics and Space Technology Washington, D.C. 20546

Attn: Edmund L. Sanchez, Acting Director
Resources and Management Systems Division (RM-3)

Jack L. Kerrebrock

Associate Administrator for

Jack & Kenehock

Aeronautics and Space Technology

TABLE OF CONTENTS

PAGE

Office of Aeronautics and Space Technology

Fluid and Thermal Physics R&T	
Materials & Structures R&T	
Controls and Guidance R&T	
Human Factors R&T	
Multidisciplinary Research	
Computer Science and Applications R&T	
Propulsion Systems R&T	
Rotorcraft R&T	
High-Speed Aircraft R&T	
Subsonic Aircraft R&T	
Subsonic Aircraft H&I	12
AERONAUTICS SYSTEMS TECHNOLOGY PROGRAMS	14
Rotorcraft Systems Technology	14
High-Speed Aircraft Systems Technology	15
Subsonic Aircraft Systems Technology	
Advanced Propulsion Systems Technology	17
SPACE RESEARCH AND TECHNOLOGY BASE	17
Fluid and Thermal Physics R&T	17
Materials & Structures R&T	18
Computer Science and Electronics R&T	21
Space Energy Conversion R&T	
Multidisciplinary Research	26
Controls and Human Factors R&T	26
Space Data & Communications R&T	27
Chemical Propulsion R&T	29
Spacecraft Systems R&T	30
Transportation Systems R&T	30
Platform Systems R&T	32
SPACE SYSTEMS TECHNOLOGY PROGRAMS	34
Spacecraft Systems Technology	
Office of Space Science & Applications	
	<u>.</u> –
ENVIRONMENTAL OBSERVATIONS APPLIED RESEARCH AND DATA ANALYSIS	35

UPPER ATMOSPHERIC RESEARCH	. 37
PLANETARY GEOLOGY R&A	. 40
PLANETARY MATERIALS	. 40
GEOCHEMISTRY/GEOPHYSICS R&A	. 41
PLANETARY ATMOSPHERES R&A	. 42
HALLEY'S COMET WATCH/EXPERIMENTS	. 43
PLANETARY INSTRUMENT DEFINITION	. 44
SOLAR TERRESTRIAL & ASTROPHYSICS ATD	. 45
EARTH AND OCEAN PHYSICS SR&T	. 45
WEATHER AND CLIMATE SR&T	. 47
POLLUTION MONITORING SR&T	. 47
SPACE PROCESSING APPLIED RESEARCH & DATA ANALYSIS	. 48
SOLAR TERRESTRIAL & ASTROPHYSICS SR&T	. 50
PLANETARY ASTRONOMY	. 53
LIFE SCIENCES SR&T	. 55
DATA ANALYSIS	. 62
ASTROPHYSICS INSTITUTIONAL SUPPORT	. 63
TECHNICAL CONSULTATION AND SUPPORT STUDIES	. 63
EXPERIMENT COORDINATION & OPERATIONS SUPPORT	. 64
ADVANCED COMMUNICATIONS RESEARCH	. 64
DATA SYSTEMS	. 65
WEATHER AND CLIMATE DATA ANALYSIS	. 67
STRATOSPHERIC MONITORING DATA ANALYSIS	
GEODYNAMICS RESEARCH & TECHNOLOGY DEVELOPMENT	. 69
RESOURCE OBSERVATION APPLIED RESEARCH & DATA ANALYSIS	. 70
SOUNDING ROCKETS	. 76
Office of Space Tracking and Data Systems	
ADVANCED SYSTEMS	. 76
Office of Space Transportation Systems	
ADVANCED PROGRAMS	. 80
Indexes	
SUBJECT INDEX	. I-1
TECHNICAL MONITOR INDEX	I-43
RESPONSIBLE NASA ORGANIZATION INDEX	I-49
RTOP NUMBER INDEX	1-55

TYPICAL CITATION AND TECHNICAL SUMMARY

RTOP ACCESSION NUMBER-

→w83-70018

505-33-12------CURRENT RTOP NUMBER

RESPONSIBLE NASA

Lewis Research Center, Cleveland, Ohio HIGH TEMPERATURE MATERIALS

-TELEPHONE NUMBER

-TECHNICAL SUMMARY

ORGANIZATION-

S J Grisaffe 216-433-4000-(505-33-32, 506-53-12, 533-04-12)-

-RELATED RTOPS

TITLE-

TECHNICAL MONITOR

The major objective of this RTOP is to advance the level of materials and processing technologies for high temperature metallic and ceramic ◄ materials in order to contribute to improving the performance, life, reliability, structural efficiency, and/or to reducing the cost of future turbine engines. The prime emphasis of the work is directed toward developing greater understanding of the interrelationships between material composite/microstructure, fabrication processes, and mechanical/physical properties. Such understanding will serve to guide the creation of advanced materials concepts and options for future higher performance/ higher durability/lower cost aircraft propulsion system components Research includes basic studies aimed at understanding the influence on microstructure/properties of reductions in and substitute elements for critical metals in superalloys (Co. Ta. Nb. Cr) as well as identification of potential iron base alloy or aluminide replacements for superalloys. This is supplemented by basic research on dissimilar material concepts as well as on ceramics/ceramic composites. Further basic studies focus on the interactions between phase composition/distribution and advanced fabrication process variables for cast/wrought/powder metals and ceramics and include rapid solidification technology (melt spinning). Also, fundamental studies of potential service environment attack (oxidation, hot corrosion, erosion, etc.) are conducted in controlled and simulated engine environments to guide and support basic and applied research on the identification and validation of advanced metallic and thermal barrier coating concepts. Tribology research aims at understanding material/lubrication/wear interaction fundamentals

RESEARCH AND TECHNOLOGY OBJECTIVES AND PLANS

a summary

FISCAL YEAR 1983

OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

Aeronautics Research and Technology Base Fluid and Thermal Physics Research and Technology

W83-70001 505-31-01

Ames Research Center, Moffett Field, Calif

COMPUTATIONAL METHODS AND APPLICATIONS IN FLUID DYNAMICS

V L Peterson 415-965-5265

(505-31-21, 506-51-11, 506-51-41, 505-37-21)

The overall objective is to develop the capability for predicting complete aerodynamic characteristics of given aircraft and missile shapes and for designing new configurations aerodynamically optimized for specific missions to a degree that preliminary concepts can be developed, evaluated, and screened with less time, cost, and wind tunnel testing New Mathematical methods, languages, and compilers will be constructed to realize the most effective use of available computer resources. Computer programs will be developed to simulate turbulence and to solve complex fluid dynamics problems for the complete spectrum of flight speeds from low subsonic, transonic, to hypersonic, and for steady and unsteady, inviscid and viscous flow over two and three dimensional configurations Fundamental experiments will be performed to verify these codes and to provide the necessary turbulence models. The Reynolds number domain will extend from conventional wind tunnel conditions to full scale flight conditions for present and future flight vehicles. The timely transfer of advanced computational aerodynamics technology to the aerospace community will be implemented by developing and disseminating computer codes applicable to practical aerodynamic problems

W83-70002

505-31-02

Lewis Research Center, Cleveland, Ohio COMPUTATIONAL FLUID DYNAMICS FOR TURBOMACHINERY J J Adamczyk 216-433-5518 (505-40-02, 505-40-03, 505-31-03, 505-40-01)

The objective of the computational fluid mechanics program for turbomachinery is to develop understanding and modeling ability for fundamental internal flow performance, and to develop analytical and computational analyses to simulate and predict the steady and unsteady flow conditions in advanced fans and compressors, cooled turbines, and advanced propellers. The analysis methods are developed into practical codes for use on NASA and industrial computers. The objective of the computational fluid dynamics programs in inlets, nozzles, and high speed propellers is to advance the application of analyses into the design environment and is fourfold in nature, namely (1) develop a uniform, general and modular system of computer codes for more effective use, (2) ensure reasonable agreement between said analyses and selected sets of benchmark verification and generic validation data for reliable application, (3) develop more 'user orientation' into these codes including case running protocol for easier application, and (4) explore and develop improved numerical methodology as applied to advanced vector computers for more cost effective operation

W83-70003

505-31-03

Langley Research Center, Hampton, Va
COMPUTATIONAL AND ANALYTICAL FLUID DYNAMICS

P J Bobbitt 804-827-3285

(505-31-13, 505-31-23, 505-31-53)

The purpose of this research is to provide the fundamental computational methods required for calculating complete aerodynamic characteristics of complex aircraft shapes and for optimizing aircraft shapes for a given mission. The primary emphasis will be basic research in numerical and analytical methods coupled with large-scale computers. Research includes viscous and inviscid flow methods for all speed ranges. The main interest is in large, nonlinear problems, studies include acceleration of iterative methods for large systems of finite difference equations using processor computers such as CYBER 203 and CRAY.

W83-70004

505-31-11

Ames Research Center, Moffett Field, Calif VISCOUS FLOWS

J D Murphy 415-965-5856

The objective is to acquire a sufficient understanding of viscous flows to permit the use of rational analysis methods in the design process. To support the above, detailed experimental data and economical computational schemes for turbulence modeling, data interpretation, and the development of design tools are required. Emphasis is placed on obtaining experimental data in terms of both mean flow quantities and turbulence parameters using pressure instrumentation, hot wires, and optical devices in the 6- by 6-foot, 2- by 2-foot, and 7- by 10-foot wind tunnels. Such data will be used to guide the development of mathematical models for turbulent structures. These mathematical models will subsequently be used to develop fast, efficient methods for the prediction of both attached and separated turbulent flows.

W83-70005

505-31-13

Langley Research Center, Hampton, Va
VISCOUS DRAG REDUCTION AND CONTROL

R V Harris, Jr 804-827-2658

Research to significantly improve our ability to predict and control the behavior of turbulent shear flows including boundary layers, free shear layers and recirculating/vortex flows will be performed including theoretical and experimental research to (1) reduce turbulent skin friction drag, (2) control stream disturbances in supersonic and hypersonic tunnels, (3) determine sensitivities of boundary layer transition process to stream disturbances, and (4) improve understanding of physics/structure of turbulent shear flows and turbulence modeling for computational fluid dynamics. Drag reduction research investigates non-planar geometries such as riblets, large eddy breakup devices, convex curvature, long wavelength surfaces, Emmons spot alteration, fuselage relaminarization, and ion wind concepts, primarily for eventual CTOL transport application Free stream disturbance research develops stagnation chamber treatments and laminar flow and rapid expansion nozzles to improve validity of wind tunnel measurements, especially for data where transition and flow separation are present. Detailed boundary layer transition studies with controlled input disturbances determine sensitivity of transition process to operational factors such as engine noise and surface irregularities. Detailed experiments using hot wires, LV/Raman, Rayleigh scattering, and resonant Doppler systems provide data for development and validation of turbulence closure models in threedimensional boundary layers, three-dimensional free mixing, corner/ recirculating/vortex flows, and shock-turbulence interaction/amplification

505-31-15 Jet Propulsion Laboratory, Pasadena, Calif.

BOUNDARY-LAYER STABILITY AND TRANSITION RESEARCH L M Mack 213-354-2138

Knowledge of where laminar-turbulent transition will occur is important for accurate drag calculations, and a significant reduction in total drag is possible if transition can be delayed by passive or active means. At present it is not possible to make a rational prediction of and where transition will occur because the relationship between transition and the disturbances that cause it is not known it is the purpose of the work described in this RTOP to investigate experimentally and theoretically the production of instability waves by external disturbance sources (receptivity problem), and the propagation of the resultant wave packets and wave trains in the boundary layer. The experimental program consists of two parts. The first part, a wave propagation experiment, will measure the wave trains and wave packets formed by continuous and pulsed point and line sources in planar and axisymmetric boundary layers. The second part, a receptivity experiment, will seek the mechanisms by which instability waves are produced by freestream turbulence, and relate the initial amplitudes and phases of the instability waves to the properties of the turbulence. The theoretical program is closely coordinated with the experiments. The point source initial-value problems will be solved both by direct numerical integration and by the method of steepest descent as generalized by Gaster for growing boundary layers. Use of the Gaster eigenvalue series will make it feasible to compute the large numbers of eigenvalues that are needed to construct the wave patterns The wave motion downstream of line sources will be obtained from the superposition of point source solutions. A model for the receptivity problem will be developd on the basis of the experimental findings The long term objective is to combine the results of the wave propagation and receptivity investigation to arrive at a rational method for the prediction of transition

W83-70007 505-31-21

Ames Research Center, Moffett Field, Calif. EXPERIMENTAL/THEORETICAL AERODYNAMICS

L L Presley 415-965-5851

The objective of this research is to expand the aerodynamic technology base and provide a basic understanding of the aerodynamic flow fields about complete aircraft configurations, as well as individual components through the angle-of-attack range and from subsonic through supersonic Mach numbers. This includes ground based testing, flight experiments, and the application and development of theoretical prediction methods Elements of this research are to (1) develop a computer structure for theory/experiment integration, (2) develop an advanced panel code (PAN AIR), (3) develop a transonic wing-body-tail code and three-dimensional transonic wing design codes, (4) develop prediction techniques for oscillating airfoil flows, (5) conduct investigations of three-dimensional bodies at high angles-of-attack, (6) measure coherent structures in turbulent separated flows, (7) develop a subsonic aerodynamic analysis code (VSAERO), (8) conduct experiment and analytical studies of aircraft trailing wake vortex flows, and (9) conduct flight experiments which are complementary to the analytical and wind tunnel research programs

W83-70008 505-31-23

Langley Research Center, Hampton, Va EXPERIMENTAL/APPLIED AERODYNAMICS J Bobbitt 804-827-2961

(505-31-53)

The objective of this research is to provide the fundamental data base needed for the efficient design of advanced aircraft and for the development of aerodynamic prediction techniques. In-house, contract and grant research will be used to advance the state-of-the-art with regard to (1) advanced airfoils for fixed- and rotating-wing aircraft, (2) cruise and maneuver aerodynamics for the design of wings and generalized aircraft configurations, (3) boundary layer growth disturbances, (4) efficient aerodynamic design procedures for supersonic/hypersonic vehicles (5) understanding of aircraft wake vortex flows and high lift design technology

W83-70009 505-31-32

Lewis Research Center, Cleveland, Ohio FLUID MECHANICS OF TURBOMACHINERY/LEWIS L D Nichols 216-433-6906 (505-40-12)

The aim of this research is to develop an understanding of fluid mechanics of turbomachinery to improve performance and reduce design costs. Increased emphasis is placed on experiments to understand internal flows and analysis codes to improve turbomachinery design systems The information will be used to improve the efficiency, operating range, distortion tolerance, durability and reliability and to reduce weight, volume,

and cost of the turbomachinery systems. Understanding of the unsteady aerodynamic forces under various flutter conditions will be obtained and codes developed and verified to be able to avoid the occurrence of flutter and minimize the effects of aerodynamic forcing terms Understanding of the steady and unsteady aerodynamic forces pertinent to noise generating mechanisms will be developed based upon experimental results and models validated to predict noise generation and provide a means for its reduction. Understanding of the effects of exciting fluid mechanic instabilities which occur in turbomachinery will be developed to determine the extent which they may be exploited to influence turbomachinery performance

W83-70010 505-31-33

Langley Research Center, Hampton, Va **AEROACOUSTICS RESEARCH**

R C Goetz 804-827-2042

(505-33-53 505-35-13, 505-42-23, 532-06-13)

The objective of this aeroacoustics research is understanding and predicting the generation and propagation of noise due to fluid flows associated with aircraft propulsion systems and then reducing or controlling the noise with minimum weight, performance, and economic penalties Analytical, computational, and experimental approaches are included in research that is conducted in-house and by grant and contract Improved understanding of the mechanisms by which fluid flows generate noise is sought, and theories and validating data bases for accurate prediction and noise reduction are developed. The experimental portion of the program emphasizes model scale laboratory studies under controlled conditions, supplemented by flight tests where appropriate The problem areas upon which the program is focused are subsonic and supersonic jet exhaust noise, flight effects on turbomachinery noise, duct acoustics, and atmospheric propagation

W83-70011 505-31-41

Ames Research Center, Moffett Field, Calif COMPUTATIONAL FLAME RADIATION RESEARCH R L Jaffe 415-965-6458

The objectives are to provide an in-depth, theoretical understanding of both combustion processes and spectroscopic techniques used for non-intrusive, laser-based flame diagnostic measurements. The research will be coordinated with several experimental programs which are not part of the RTOP The approach will utilize first principles calculations of the fundamental properties, if they are not well known, of molecules which have important roles in combustion processess. These data will be coupled with the results from numerical flame structure models to produce synthetic spectra which can be compared to experimental flame spectra taken under identical conditions. Significant differences between the experimental and theoretical spectra would indicate deficiencies in the numerical model which would then be improved until agreement is attained Consequently, this research will lead to the establishment of a validated combustion model which is capable of reliably predicting flame properties. The theoretical molecular property data will also be used to synthesize cross sections for spectroscopic transitions which can be used for diagnostic measurements of flame temperature and composition. This research will help identify new non-intrusive analytical techniques for combustion experiments and add to the effectiveness of existing diagnostic methods

505-31-42

W83-70012 Lewis Research Center, Cleveland, Ohio **BURNING FUNDAMENTALS & HEAT TRANSFER** R A Rudey 216-433-6625 (505-40-22)

The objective of the Combustion and Heat Transfer Research Program is to provide technology for advanced combustion, turbine and aircraft fuel systems for future civil and military applications aimed at improving performance, durability, and reliability while achieving fuel flexibility and reduced emissions by establishing a more complete and basic understanding of fundamental combustion and heat transfer phenomena typical of gas turbine engines and to support the development of advanced computational techniques for accurately characterizing the governing aerothermodynamic process. The effort is focused on (1) developing a fundamental knowledge and understanding of the characteristics and effects of notential alternative fuels (2) achieving a basic understanding and analytical representation of the fundamental aerodynamic and chemical kinetic phenomena governing the combustion process, (3) developing analytical models for predicting the internal aerothermodynamic performance of combustors, turbines, and fuel systems, and (4) developing analytical models for predicting thermodynamic and transport properties and chemical reaction rates for hydrocarbon fuels. The program includes both fundamental and applied research activities conducted in-house, under grants to universities, and under contracts to industry Overall coordination with other government agencies, such as DOD,

DOE, DOT, EPA, and with industry is maintained in order to provide the proper direction and scope to the program

W83-70013

505-31-51

Ames Research Center, Moffett Field, Calif TEST METHODS AND INSTRUMENTATION G Lee 415-965-5861

The general objective of this research is to provide the technology for increased aerodynamic experimental research capability required to improve prediction of performance and flight characteristics of conceptual or new aircraft designs and the exploration of advanced aerodynamic concepts. This includes both ground-based and flight test capability improvements. Flow quality, measurement of model attitude and deformation, minimization or elimination of wind tunnel wall constraint effects, and means for simulating higher Reynolds number flows will be investigated analytically and experimentally to improve the quality of test results. To improve the state-of-the-art in non-intrusive measurement capability, advanced laser velocimeter and holographic interferometric instrumentation systems will be developed to obtain fundamental fluid mechanic measurments such as mean velocities, turbulence intensities, densities, and Reynolds stress components Infrared camera technology will be explored as a means of locating shock waves and regions of separation on wind tunnel models. To improve the state-of-the-art of flight test techniques and flight measurement capability, development efforts are planned which include an air data/inertially based integrated sensor system, a miniaturized multichannel pressure sensor system, a high accuracy fuel flow meter, and hot wire/film sensor signal conditioning system

W83-70014

505-31-52

Lewis Research Center, Cleveland, Ohio PROPULSION INSTRUMENTATION N C Wenger 216-433-6646 (505-40-52)

The objective of this RTOP is to develop sensors and measurement systems that have application in studies of fundamental phenomena, in component research and development, and in full-scale engine experimentation and testing. Part of the effort is focused on developing miniature minimally intrusive sensors for measuring temperature, heat flux, and strain in a wide variety of applications. The balance of the effort is directed at research on nonintrusive measurement systems. usually employing lasers, for the measurements of strain, gas flows, combustion gas species and temperature, and smoke parameters. This effort is closely coordinated with the development of bench mark experiments where critical measurements are required to determine the validity and accuracy of various types of fluid mechanic, combustion, and structural models and computer codes that are currently under development

W83-70015

505-31-53

Langley Research Center, Hampton, Va EXPERIMENTAL TEST TECHNIQUES

J Bobbitt 804-827-2961

The technical objective is to provide the technology for increased ground based aerodynamic experimental research capability and to develop the specific test technology required to fully exploit the unique capabilities of the new pressurized cryogenic wind tunnels in the performance of research and development studies related to advanced aerodynamic test concepts at full scale Reynolds numbers. This objective will be accomplished utilizing in-house, contract, and grant research to (1) extend development of cryogenic technology and full-scale Reynolds number test techniques to insure maximum utilization of the unique research and development capabilities of the new Langley National Transonic Facility, (2) continue development of technology required for sound engineering of models for the high pressure cryogenic environment including establishment of model criteria, (3) advance the state-of-the-art of instrumentation techniques and provide instrumentation capable of operating over a wide temperature range with emphasis on minimizing measurement error and time required for data collection. (4) advance the state-of-the-art of experimental methods including transonic tunnel wall interference effects and magnetic suspension and balance systems, and (5) provide operational support in terms of liquid nitrogen and staffing for calibration of the National Transonic Facility

W83-70016

505-31-83

Langley Research Center, Hampton, Va MATHEMATICS FOR ENGINEERING AND SCIENCE

Robert H Tolson 804-827-2664

The objective of this RTOP is to provide new mathematical methods and models and apply these to understanding aerospace phenomena, improving computer simulation, and supporting advanced developments The research is carried out by a combination of in-house efforts, university research grants, and the continuing operation of the Institute for Computer Applications in Science and Engineering (ICASE) located at the Langley Research Center The in-house and grant efforts include research dealing with numerical solutions of differential and algebraic systems, data analysis, computer graphics, symbolic and algebraic manipulation, data base management, programming languages, microprocessor software, and software engineering. The broad research areas pursued in ICASE include numerical analysis with particular emphasis on the development and analysis of basic numerical algorithms, computational research in engineering and science in selected research areas of concern to the Langley Research Center, including fluid dynamics, structural analysis, acoustics, guidance and control, and other appropriate areas, and computer systems and software, such as advanced computers, microprocessors, and computer graphics

Materials and Structures Research and **Technology**

W83-70017

505-33-10

National Aeronautics and Space Administration, Washington, D C RESEARCH IN ADVANCED MATERIAL CONCEPTS FOR AERO-

Michael A Greenfield 202-755-3277

The objective is to conduct advanced fundamental research on advanced material concepts for aeronautics. The research will be performed by educational institutions utilizing interdisciplinary capabilities in materials engineering, mechanical engineering, aeronautical engineering, civil engineering, and chemistry. Research projects will involve ceramic and composite materials characterization, structural integrity, structural analysis and design, processing techniques, and systems applications Advisory services to guide R and D in advanced aerospace materials and structures are provided by the National Materials Advisory Board, a unit of the Division of Engineering, National Research Council, National Academy of Sciences, and National Academy of Engineering

W83-70018

505-33-12

Lewis Research Center, Cleveland, Ohio HIGH TEMPERATURE MATERIALS S J Grisaffe 216-433-4000 (505-33-32, 506-53-12, 533-04-12)

The major objective of this RTOP is to advance the level of materials and processing technologies for high temperature metallic and ceramic materials in order to contribute to improving the performance, life, reliability, structural efficiency, and/or to reducing the cost of future turbine engines. The prime emphasis of the work is directed toward developing greater understanding of the interrelationships between material composite/microstructure, fabrication processes, and mechanical/physical properties. Such understanding will serve to guide the creation of advanced materials concepts and options for future higher performance/ higher durability/lower cost aircraft propulsion system components Research includes basic studies aimed at understanding the influence on microstructure/properties of reductions in and substitute elements for critical metals in superalloys (Co, Ta, Nb, Cr) as well as identification of potential iron base alloy or aluminide replacements for superalloys This is supplemented by basic research on dissimilar material concepts as well as on ceramics/ceramic composites. Further basic studies focus on the interactions between phase composition/distribution and advanced fabrication process variables for cast/wrought/powder metals and ceramics and include rapid solidification technology (melt spinning) Also, fundamental studies of potential service environment attack (oxidation, hot corrosion, erosion, etc.) are conducted in controlled and simulated engine environments to guide and support basic and applied research on the identification and validation of advanced metallic and thermal barrier coating concepts. Tribology research aims at understanding material/lubrication/wear interaction fundamentals

505-33-13

Langley Research Center, Hampton, Va ADVANCED STRUCTURAL ALLOYS R C Goetz 804-827-2042

(505-33-23, 505-43-43)

The objectives of this research are focused on understanding the metallurgical structure/mechanical property relationships characteristic of advanced structural alloys. This understanding is expected to provide a basis for new or improved concepts to achieve more efficient structural alloys for future aircraft applications. Current research includes (1) fundamental studies of the structure/property relationships in advanced powder metallurgy (PM) aluminum alloys as they relate either to alloy chemistry, thermomechanical treatments, or aging behavior, and (2) the development of new/improved processing methods to provide a basis to achieve more efficient structural shapes. Research in advanced PM aluminum alloys will include optimizing powder processing techniques, alloy chemistry, and thermomechanical treatments based on a fundamental understanding of the metallurgical features desirable for high performance applications. Research in processing technology will emphasize superplastic forming (SPF) of advanced aluminum alloys to achieve unique and highly efficient structural shapes, SPF effects on microstructure and mechanical properties will be characterized Adoptability of the SPF process to advanced PM aluminum alloys will be explored

W83-70020

505-33-21

Ames Research Center, Moffett Field, Calif LIFE PREDICTON. FATIGUE DAMAGE AND ENVIRONMENTAL EFFECTS IN METALS AND COMPOSITES H G Nelson 415-965-6137

A combined experimental and analytical program will continue in an effort to characterize and better understand the fatigue and fracture behavior of both metallic and composite (graphite/epoxy) materials used or anticipated to be used in airframe structures. Additionally, the knowledge will be applied where practicable, to help solve existing engineering problems and to improve life prediction procedures of real aerospace structures For composite materials, a modified timetemperature super position approach is used to establish correspondence between stress, moisture, temperature, and time as these variables influence the durability of complex graphite/epoxy laminates. It is our aim to develop the methodology required to obtain accurate constitutive relationships such that improved accelerated test procedures and life prediction techniques can be applied to real aerospace composite structures which behave in a viscoelastic manner Areas of interest include all types of mechanical and physical behavior including moisture absorption and physical aging. In all cases the ranges of applicability of this mechanics approach are being established through relevant mechanistic investigations. For metallic materials, crack initiation and subcritical crack growth stages of fracture are being characterized using a fracture mechanics approach. Our primary objective is to understand the influences of the chemical environment on fracture behavior in order that we may predict the stress corrosion and corrosion fatigue behavior of aerospace structural materials including advanced P/M aluminum alloys Considerable emphasis is placed upon understanding the kinetic aspects of embrittlement and in particular the importance of surfaces and surface reactions

W83-70021

505-33-22

Lewis Research Center, Cleveland, Ohio LIFE PREDICTION FOR ENGINE MATERIALS Marvin H Hirschberg 216-433-4000 (533-04-12)

The major objective is to obtain a better understanding and description of the creep-fatigue viscoplastic flow and fracture of advanced materials systems. The approach is to formulate and verify practical concepts involving cumulative damage assessment and life prediction methods that account for interactive effects on the crack initiation, crack propagation, and fracture of structural components when subjected to complex time dependent patterns of temperatures and cyclic loads

W83-70022

505-33-23

Langley Research Center, Hampton, Va LIFE PREDICTION FOR STRUCTURAL MATERIALS R C Goetz 804-827-2042 (505-33-13, 505-33-33, 506-53-23)

The objectives of this research are to understand the fatigue and fracture behavior of experimental and engineering materials and to develop reliable life prediction techniques that are applicable to the use of these materials in aircraft structures. Formulation of a theoretical framework for life prediction and experimental validation of the theoretical concepts involved form a major part of this research focus. Characterization of the integrity of structural materials by nondestructive techniques is also included. The nondestructive materials research involves both theoretical modeling and experimental verification of advanced ultrasonic/acoustic phenomena as related to understanding fundamental material properties and behavior under complex 'oads Research in fatigue and fracture includes structural alloys as well as thick-section, polymeric composites In depth analyses of the fracture and crack growth processes will be conducted and comparisons made to validate and extend the reliability of current life prediction models. Nondestructive materials research will focus on providing a scientific basis for quantitative ultrasonic analysis of the integrity and properties of composites and metals Precision measurement techniques to determine the physical mechanisms of materials behavior such as the mechanics of impact damage in composites will constitute a significant part of the nondestructive materials research

W83-70023

Ames Research Center, Moffett Field, Calif

FIRE RESISTANT COMPOSITES

I A Parker 415-965-5225

(505-45-11)

The objective is to develop fiber resin composite materials which can be processed by commercial methods for primary and secondary composite aircraft structures which are environmentally stable, mechanically reliable, and cost effective. Composites with improved toughness, fire resistance and processing parameters are the objectives for candidate polymers and fibers. Determination of interrelationships of molecular structure with the desired properties will include the coding and cataloging of the chemical structures of important matrix resin systems and establishing a workable polymer science data base. Low or strain free composites will be developed by working with those oligomer systems capable of low temperature, approximately 175 F. gelation and curing at 350 F or less Liquid or low melt viscosity oligomers will be developed from aromatic bismaleimides (BMI), polystyrylpyridines (PSP), and divinyl or diallyl monomers. Polymer blends (e.g., rubber toughening) will also be studied Carbon fibers with new sizing compounds with subsequent combination of different arrays of fibers and lay-up geometries to reduce impact damage will also be investigated Engineering tests include DMA, shear, impact, torque, tensile, and flammability. Possible matrix resins for high temperature applications are phosphorylated BMI, polyphthalocyanines, aspartimides, and PSP, evaluation of these systems will be completed Experimental and theoretical studies on polymers exhibiting electrical conductivity are required, as are quantum chemistry and other computational methods applied to various polymers and their model compounds

W83-70024

505-33-32

505-33-31

Lewis Research Center, Cleveland, Ohio HIGH TEMPERATURE ENGINE COMPOSITES

H B Probst 216-433-4000

(505-33-12)

The overall objective of this research is to identify and evolve composite materials and processing technology with potential for aero propulsion components having lower weight, higher use temperature, higher strength, reduced cost, and greater reliability. A wide range of matrix materials is under investigation including polymers, metals, and ceramics. In the area of polymer matrix composites, emphasis is placed on synthesis of high temperature (to 370 C), processible resins, resins of improved toughness, and on development of chemical characterization methodology that supports understanding of polymerization and in-service reactions. High temperature adhesives are also being addressed. In metal matrix composites, emphasis is placed on improving key properties of high temperature composite systems as well as on understanding how these materials fail and degrade so as to overcome their deficiencies In ceramic matrix composites, studies are devoted to polymeric precursors which will give high temperature ceramic matrices Micromechanics of composite systems are under study to eventually develop a modeling capability to predict strength and toughness

505-33-33

Langley Research Center, Hampton, Va COMPOSITES FOR AIRFRAME STRUCTURES

R C Goetz 804-827-2042

(505-33-23, 506-53-23)

The objective is to achieve the full weight reduction potential of highly loaded composite structures. The approach is to improve matrix properties, damage tolerant concepts, analytical predictive methods, and understanding of aging effects Structural resins and adhesives with improved toughness, moisture resistance, processability, and thermal performance will be synthesized Fundamental factors which control toughness and damage tolerance in resins and composites will be determined Impact damage and residual strength will be measured and modeled mathematically. The effectiveness of bolted composite joints and woven buffer strips will be studied. Using advanced structural concepts and design methods, flat, curved and stiffened structures will be made and tested in compression, tension, combined loads, and after damage Analytical methods will be developed to predict properties Long-term durability under expected service environments will be studied using ground based and flight service exposure. Predictive analytical methods for environmental effects will be developed with emphasis on verification of accelerated test methods. Analyses for describing the nonlinear behavior of structures including postbuckling and ultimate strength will be developed Processing methods for new resin systems will be established with emphasis on economics and consistent quality Resin rheology and cure mechanics studies will be used as the basis for developing cure processes

W83-70026

505-33-41

Ames Research Center, Moffett Field, Calif. FLIGHT LOADS ANALYSIS

A L Carter 805-258-3311

This RTOP has four primary purposes (1) to study unsteady aerodynamic loads and flutter suppression at transonic speeds using OAST research flights (2) to study airload and Flight Deflection Measurement System techniques on large, flexible aircraft, (3) correlation of flight measured and predicted buffet for the AFTI/F-111 aircraft, (4) to develop and verify flight loads analysis methods for flight testing applications

W83-70027

505-33-42

Lewis Research Center, Cleveland, Ohio ENGINE DYNAMICS AND AEROELASTICITY L Berke 216-433-4000

(505-33-52)

The objective of this program is to develop improved methods of analyzing the structural dynamics and aeroelasticity of aircraft turbine engines so that the structural design of an engine can be more on design calculations and less on testing and rebuild procedures. New methods will be developed under this program which can take advantage of increased computer capabilities. The approach will be to develop mathematical models of the engine and its structural components. These models will take into account the interactions between components including those at frictional interfaces, and provide a more comprehensive treatment of the internal degrees of freedom of these components Steady state and transient situations, such as blade loss, will be addressed More thorough methods of predicting aeroelastic stability and forced response will be developed

W83-70028

505-33-43

Langley Research Center, Hampton, Va LOADS AND AEROELASTICITY

R C Goetz 804-827-2042

(533-02-73)

The objective is to develop and validate improved methods for analytically determining loads, structural response, and structural stability of aerospace systems considering the dynamic and aeroelastic characteristics of the systems and structural interactions with flight control sub-systems, and to use these methods in the development and evaluation of techniques for eliminating or minimizing flutter, buffet, and other undesirable response phenomena, and for the enhancement of performance, ride quality, and service life Research will be conducted to provide more accurate unsteady aerodynamic theories, particularly in the transonic range Advanced aeroelastic analysis methods will be evaluated and validated by both wind tunnel tests and flight tests using the DAST concept (Drones for Aerodynamic and Structural Testing) Emphasis will be on measurements of transonic aerodynamic loads, and flight validation of active control systems for load alleviation and flutter suppression. A decoupler-pylon concept for wing store flutter suppression will be evaluated in flight tests on a fighter airplane. Basic wind tunnel flutter studies will be used to gain a better understanding of the flutter characteristics of advanced aerodynamic configurations The obsolete dynamic data acquisition system of the LaRC Transonic Dynamics Tunnel will be replaced with modern hardware and appropriate software to allow efficient operation of the tunnel

W83-70029

505-33-53

Langley Research Center, Hampton, Va

ADVANCED STRUCTURAL ANALYSIS METHODS

R C Goetz 804-827-2042

The objective is to understand the behavior of composite structures under crash loadings. In-house test procedures will be developed and tests conducted to measure the response of composite structural components under crash conditions. Test articles requiring special tooling will be fabricated under contract. Preparations for full-scale crash test of a B-720 aircraft will continue in cooperation with Ames (Dryden) and FAA Structural analysis and sizing methods will be developed for aerospace structures. Particular attention will be paid to nonlinear behavior such as postbuckling phenomena and ultimate strength of composite structures An interdisciplinar research team (PICASSO) will continue development of integrated analysis and synthesis methods and associated computer software. Large-scale optimization of a transport aircraft wing for fuel efficiency will be pursued in cooperation with Lockheed-California Company The research will also (1) develop and evaluate structural concepts and thermal management techniques for application to airframes and engines of aircraft which cruise in supersonic to hypersonic regime, (2) develop and verify practical concepts for alternate Mach numbers and oxygen enrichment in 8' High Temperature Structure Tunnel, and (3) develop improved methods of analysis for noise in aircraft cabins and techniques for minimizing noise transmission

to enhance ride quality. The research encompasses in-house laboratory studies and out-of-house analysis and experiments on aircraft and model cylinders

Controls and Guidance Research and Technology

W83-70030

505-34-01

Ames Research Center, Moffett Field, Calif

FLIGHT CONTROL CONCEPTS AND RELIABILITY ENHANCE-MENT

J A Franklin 415-965-5009

(505-34-11, 505-34-03, 505-36-11, 505-42-11, 532-06-11, 505-34-33)

Research in advanced control technology will be pursued to develop the technology base for design of reliable, flight crucial control systems for aircraft and aerospace craft that provided improved operational capabilities over these vehicles flight envelopes. Analytical studies will be conducted to investigate concepts and methodology Ground based simulation and flight experiments will be carried out to substantiate the methodology Nonlinear inverse system concepts and optimal control methods will be employed for vehicles that exhibit significant aerodynamic and kinematic nonlinearities and control redundancy. Fly-by-wire control, fault tolerant microcomputer and actuation system concepts will be explored for the purpose of enhancing control reliability. Flying qualities design requirements for super augmented aircraft will be defined and automated control concepts developed such as for air combat missions University grants will be awarded to support promising research in the field and to keep NASA abreast of new advances in control theory pertinent to analysis and synthesis of reliable flight control systems

W83-70031

505-34-02

Lewis Research Center, Cleveland, Ohio CONTROL THEORY AND METHODOLOGY

Teren 216-433-4000

The objective is to provide an improved technology base for future engine control system development through the development of advanced multivariable control theory and methodology, and reliable fault tolerant distributed controls. Multivariable control design techniques are developed and applied using time and frequency domain methods. Sensor failure detection, isolation and accommodation algorithms are developed for single and multiple engine applications. The latest VLSI circuitry technologies are utilized in multiple processor fault tolerant full-authority electronic propulsion control architectures. Both software and hardware technologies are pursued

W83-70032

505-34-03

Langley Research Center, Hampton, Va

AIRCRAFT CONTROLS. THEORY AND APPLICATIONS

J R Elliott 804-827-4681

(505-34-01, 505-34-02, 505-35-02, 505-45-03)

NASA has a primary national responsibility and plays a major role in the area of flight control research and technology innovations and development. The design goal of fuel efficient, high performance aircraft of the future is resulting in increased reliance on controls technology This trend demands a continuing activity of investigations, development, and validation of advanced stability, control, and guidance concepts which will permit the control system designer to adequately cope with the increasingly complex demands of modern aircraft control system designs. The objectives of this RTOP are to develop and validate advanced theoretical concepts for control of aircraft and their trajectories, to develop and validate methodology for the integrated design of advanced flight control systems, and to develop guidelines and criteria for designing full-authority control systems for highly augmented aircraft. The research to be conducted is an effort towards fulfilling the need to maintain the U.S. in a competitive position in the stability, control, and guidance disciplines applied to highly augmented civil and military aircraft Advanced control theory and system identification procedures, computer program development and techniques for computer aided aircraft design processes, mathematical modeling procedures and analysis/synthesis procedures for flexible aircraft with active controls, and aircraft flying qualities and control system design criteria research will be pursued through in-house, contract, and grant studies with leading specialists Research activities will encompass studies of a theoretical nature, validation studies through simulation and flight test studies

W83-70033

505-34-11

Ames Research Center, Moffett Field, Calif ADVANCED CONTROLS AND GUIDANCE

D G Denery 415-965-5427

(505-34-01, 532-01-11 532-06-11, 505-45-11, 533-02-51)

The objective of this research is to develop a technology base for the design, validation, and assessment of flight crucial controls and to develop advanced guidance concepts for both civil and military missions The work will be accomplished within six tasks (1) the development, evaluation, and flight test of advanced flight control techniques utilizing the F-8 flight (2) the development and evaluation of advanced verification and validation tools applicable to digital flight control systems, (3) the development of theory and techniques to design and evaluate advanced flight path guidance concepts that are compatible with the future National Airspace System, (4) the development of air traffic control flow management algorithms that exploit the potential of both advanced on-board guidance and ground computers to increase capacity and efficiency of the National Airspace System. (5) the development of theory and techniques to design and evaluate flight path guidance systems for military missions including automated air combat, and (6) the development and evaluation of advanced guidance concepts for landing on small ships

W83-70034

505-34-13

Langley Research Center, Hampton, Va

ADVANCED NAVIGATION, GUIDANCE AND CONTROLS **TECHNOLOGY**

H Milton Holt 804-827-3681

(505-34-23 505-45-03, 505-37-13 505-45-33, 505-34-03, 505-37-23, 505-43-13)

Aircraft of the 1990 to 2000 time period can be more efficient and profitable as a result of new technology advances. The acceptance of those advances can be accelerated by reducing the risk of the new technology. The objective of this effort is to develop a technology base for the design, validation, assessment of flight-crucial controls and to develop advanced guidance concepts and crew station interface devices for improving aircraft flight path guidance. The approach is to develop the methodology for fully integrated flight-crucial controls and guidance functions, identify candidate system architectural concepts, establish a creditable validation process for advanced digital system designs through the development of new assessment methods, emulation/simulation techniques, and physical testing techniques, develop theories and techniques to design and evaluate advanced flight path guidance systems, develop advanced display concepts and information input/output techniques, and investigate lightning environmental effects

W83-70035

505-34-23

Langley Research Center, Hampton, Va AIRLAB OPERATIONS

D G Holden 804-827-3681

(505-34-13)

The objectives are to operate, maintain, and enhance the role of AIRLAB to study, evaluate, and demonstrate the safety, reliability, and performance of fault-tolerant electronic systems for future aerospace applications, maximize the utility and operating time of AIRLAB equipment by providing hardware and software maintenance support in an efficient and timely manner, and implement new or improved hardware and support software to enhance AIRLAB capabilities, improve ease of use, and increase productivity

Human Factors Research and Technology

W83-70036

505-35-01

Ames Research Center, Moffett Field, Calif **HUMAN FACTORS FACILITIES OPERATIONS** H P Klein 415-965-5094

(505-35-21, 505-35-31, 505-42-41)

This RTOP provides for the operation, maintenance modification, and upgrade of the research facilities of the Man-Vehicle Systems Research Division at Ames Research Center The division conducts a variety of human factors research programs fo NASA, DoD, FAA, industry, and other Government agencies in the areas of advanced concepts of flight management systems, human factors in aviation safety, helicopter/ VTOL human factors, workload/performance measurement, perception, and simulation and training technology. This research requires the utilization of part-task and part-system experiment areas, computers, and cockpit simulators in N239 and N239A and the full-system/fullmission flight simulators in N257 (the Man-Vehicle Systems Research Facility) Complete facility operations staff including computer systems and data analysis programmers, computer operators, computer and othe special purpose electronic and electro-mechanical equipment maintenance technicians, experimental device fabrication technicians, simulation operation engineers and technicians, and other required facility services such as janitorial support, and general building maintenance are provided Also covered by this RTOP are hardware and software related capital expenditures necessary to maintain, operate, and upgrade these laboratories and their component systems

W83-70037

505-35-13

Langley Research Center, Hampton, Va **COMMUNITY RESPONSE TO NOISE**

Robert C Goetz 804-827-3577

(532-06-13 505-33-53 505-32-33, 505-42-23)

The objective of this research is to develop technologies for quantifying and minimizing the impact of aircraft noise on airport community residents and on aircraft crews and passengers. Research studies utilize laboratory tests to subjectively evaluate the properties of aircraft-generated noise that are responsible for causing annoyance. The laboratory program is aimed at developing criteria for evaluating the noise from single aircraft events as well as valuating the response to longer term multiple aircraft exposures. Subjects will experience the recorded noise of aircraft or the synthesized noise of future systems under simulated indoor, outdoor, and aircraft interior conditions. Various psychophysical attributes such as annoyance and speech interference will be judged by the subjects The resulting single-event dose-response relationships will be directly applicable to the engineering assessment of source noise modifications and to aircraft certification procedures whereas the multi-event results will be applicable to the evaluation of aircraft/airport operations. Field studies and/or the reanalysis of existing survey data will be directed toward the refinement of a predictive model of community acceptance which includes, in addition to the noise level, nonacoustical factors such as the number of events, the time of day/night, the population distribution, and any situational or psychological factors may influence response. The model will be formulated such that it can be used to assess the noise abatement resulting from A/C modifications, A/C operational changes, and land-use strategies

W83-70038

505-35-21

Ames Research Center, Moffett Field, Calif FLIGHT MANAGEMENT SYSTEMS

H P Klein 415-965-5094 (505-35-41, 505-35-51, 505-35-24)

This research is designed to identify factors which contribute to or cause human error in the aviation system, and to explore methods to prevent human error accidents by eliminating or by minimizing the adverse impact of such errors when they occur. Descriptive studies of the Aviation Safety Reporting System data base are used to determine system factors associated with human error, and to identify potential solutions to the human error problems so identified. Studies of pilot fatigue and circadian desynchronosis are being conducted to determine the extent to which these factors play a role in operational problems associated with aircrew performance. The development and validation of standardized objective and subjective measures of pilot workload and performance will be conducted in addition the development of principles of automation/crew interaction will be pursued. Specific analyses of future information transfer techniques will be examined to determine their effect on aircrew performance in both current and future flight management environments Virtually all activities in this RTOP are coordinated or joint with DOD

W83-70039

505-35-23

Langley Research Center, Hampton, Va CREW COCKPIT INTERFACE TECHNOLOGY

J F Garren 804-827-3621

The objective of this program is the development of a technology base required for efficient operation in the current and future air transportation system, including technical integration of airborne systems with evolving air traffic control (ATC) systems technology, definition of display factors, control concepts, and intelligent aids for optimizing the utilization of crew capabilities, development of operating procedures to improve safety, efficiency, and capacity, and development of methodologies for assessing crew performance and workload. Simulation facilities and flight vehicles, equipped with appropriate displays will be operated in conjunction with a simulated ATC environment to represent flight operations in an advanced en-route and terminal area environment

W83-70040

505-35-31

Ames Research Center, Moffett Field, Calif PILOTED SIMULATION TECHNOLOGY H P Klein 415-965-5094

(505-35-21, 505-42-41, 505-35-01)

The general objective of this research and development activity is

to provide a scientific and technical base that can be used as a resource to develop valid, reliable, and economical simulators for aeronautical research, development, and crew training. Specific objectives are to (1) develop human factors principles that can be used to evaluate and guide the effective utilization of flight simulators in research and training, and (2) to develop advanced hardware and software concepts for high fidelity simulation of vision and motion environments. The first of these two objectives will be met by continuing the study of human factors of optimal dynamic displays, including research on spatio-temporal parameters, resolution, dynamic range, field of view, environmentally reduced visibility, etc., refining an analytical method for evaluating simulator motion performance based on a human sensory processing model, and studying the use of mission oriented simulation for improving the quality of simulator training and research, especially for performance concerned with information transfer. The second objective will be met by developing validation techniques for evaluation of CTOL, STOL, and rotorcaft simulations, developing techniques and concepts for simulation hardware, such as computer graphics displays, head up displays and motion systems, and developing computational techniques that increase the effective speed of digital simulation computers

W83-70041

505-35-33

Langley Research Center, Hampton, Va FLIGHT SIMULATION TECHNOLOGY

J D Shaughnessy 804-827-3917

This RTOP's objective is the development and application of a technology base that will permit the economical and reliable substitution of simulators for actual flight operations in support of Langley's research programs. It will cover both in-house and contractual studies which address how much fidelity is enough, can enough be quantified with precision, if we know quantitatively what we want in simulator design, can it be achieved and at what cost, and if achieved, what assertions can be made regarding validity? As a part of the agency-wide program, Langley participates in those areas that naturally evolve from the traditional base interests of the center. Chief among those interests is the recognition that the development of engineering and perceptual requirements for man-in-the-loop simulation is a complex task involving trade-offs between simulation fidelity and costs. In specifying the cue environment the designer must establish the need for particular cues as well as the requisite fidelity of presentation. Unfortunately, the decisions are quite difficult to make objectively, inasmuch as the choices depend on complex psychological as well as engineering factors Particular emphasis will be placed at LaRC on several technical disciplines, moving within each discipline from a research cell focus for new and emerging technologies to fully integrated system studies and cost/benefit analyses These disciplines include vision/visual systems, man/vehicle performance assessment, atmospheric modeling, non-visual cue generation, computer science (real time), and analytical techniques and models for analysis of man/machine systems

Multidisciplinary Research

W83-70042 505-36-11 Ames Research Center, Moffett Field, Calif FUNDS FOR INDEPENDENT RESEARCH (AERONAUTICS) D J Peake 415-965-5113

(506-56-11)

The objective of this RTOP is to support innovative and discretionary basic research in areas related to aeronautics. The program pursues basic investigations of new technologies in fundamental science and engineering needed to satisfy NASA's requirements in aeronautics including the technical fields of aerodynamics, fluid mechanics, flight mechanics, power, guidance and navigation, applied mathematics, propulsion and man-machine integration. The OAST Research Council and the Ames Basic Research Council review unsolicited proposals that have been judged to be worthy of support on scientific or engineering grounds, but have not been selected for support because of funding limitations in other research programs. Those research proposals that are judged by the Council and the ABRC to be worthy of support on a scientific or engineering basis are selected as candidates for funding

W83-70043

505-36-12

Lewis Research Center, Cleveland, Ohio

FUND FOR INDEPENDENT RESEARCH (AERONAUTICS)

Marvin E Goldstein 216-433-4000

The objective is to support and encourage innovative, long range, high risk, basic research in areas related to aeronautics. The program pursues basic investigations of, and facilitates exchange of information about new technologies in fundamental science and engineering needed to satisfy NASA's requirements in aeronautics. Some of the specific

technical fields are fluid mechanics (including turbulence and computational fluid mechanics) propulsion (including fluid mechanics, fans, compressors, fuels, combustors and mechanical components), aeroacoustics, materials, dynamics and control, and aeroelasticity. The program is carried out primarily through grants which are selected by the Research Advisory Board. It allows OAST to initiate fundamental studies in areas not presently included in a specific discipline program. The funds are also used to bring speakers and visiting university scientists to the lab and to hold workshops and seminars.

W83-70044

505-36-13

Langley Research Center, Hampton, Va FUND FOR INDEPENDENT RESEARCH (AERONAUTICS)

R H Tolson 804-827-2664

The objective of this program is to support basic research in universities in areas related to aeronautics through the funding of a limited number of unsolicited research proposals. University research proposals, that have been given high technical evaluations but are not funded through the research programs, are reviewed by the Langley University Research Proposal Review Committee Those research proposals that are judged by this committee to be worth supporting on a scientific or engineering basis are selected as candidates for funding through this plan. The committee establishes a priority listing of these proposals and selects those efforts that are judged to be the more innovative and aimed at the longer term research of potential relevance to future NASA aeronautics programs.

W83-70045

505-36-21

Ames Research Center, Moffett Field, Calif
AERONAUTICS GRADUATE RESEARCH PROGRAM

D H Hickey 415-965-5036

The objective of this program is to develop the interest of student engineers in the field of aeronautical engineering, provide on the job training in research methods, and augment or enhance NASA's research program The approach is to bring the center's needs to the attention of the academic community. Research topics are established by mutual agreement and the tasks are especially selected to not only be relevant to NASA's mission and of interest to the university faculty, but to foster cooperative programs between the Government and Academia Cooperation may be evidenced by use of each others facilities and performance of the research at NASA installations. The Ames/Moffett research conducted under this RTOP in FY-83 will include aerodynamics, acoustics flight mechanics, and computational fluid dynamics. It will be both theoretical and experimental in nature. The Ames/Dryden research supports work to improve methods and techniques in flight testing of aeronautical vehicles. The program is to promote the overall improvement, in flight research through simultaneous advancement in instrumentation testing methods, equipment, data recording, and data analysis

W83-70046

505-36-22

Lewis Research Center, Cleveland, Ohio GRADUATE PROGRAM IN AERONAUTICS

Marvin E Goldstein 216-433-4000

The objective is to sponsor graduate research and training in aeronautics which is relevant and acceptable to both NASA and the university Starting in FY-71, grants have been awarded, each for a performance period of approximately three years, in areas covering a broad spectrum of research activities relevant to the center's mission in aeronautics. Specific fields of research include fluid mechanics, propulsion, aeroacoustics, materials, dynamics and control, aeroelasticity and noise emissions.

W83-70047

505-36-23

Langley Research Center, Hampton, Va GRADUATE PROGRAM IN AERONAUTICS

Robert H Tolson 804-827-2664

The objective of this plan is to support university research in aeronautics in which there is substantial involvement of graduate students at the Langley Research Center While formal classroom activities are conducted at a university campus, a substantial portion of the graduate research activity is carried out at the Langley Research Center in conjunction with Langley staff and overall guidance of a faculty advisor. The research pursued under this RTOP is aeronautics related Research grants or cooperative agreements are awarded to a number of universities to pursue aeronautical research with support being mainly for graduate research students and to some extent faculty members associated with those students. The selection of graduate research topics is determined by joint agreement between the university and NASA staff.

W83-70048

505-36-43

Langley Research Center, Hampton, Va JIAFS BASE SUPPORT Robert Tolson 804-827-2664 (505-36-23)

The objective of this plan is to provide a core level of funding for the Joint Institute for Advancement of Flight Sciences (JIAFS), which is an extension of the School of Engineering and Applied Science, George Washington University, located at the Langley Research Center This core program allows the flexibility for developing new areas of research and through support for ongoing administrative personnel and provision for additional Graduate Research Scholar Assistantship appointments, will give JIAFS a degree of institutional stability and flexibility. The specific research topics in the program will be determined through mutual agreement between LaRC and GWU

Computer Science and Applications Research and Technology

W83-70049

505-37-01

Ames Research Center, Moffett Field, Calif NUMERICAL AERODYNAMIC COMPUTATIONAL TECHNIQUES F R Bailey 415-965-6419

The primary objective of the numerical aerodynamic simulator (NAS) project is to design and develop a unique, large scale, high performance computational resource for solving viscous three dimensional fluid flow equations specially oriented toward the solution of aero and fluid dynamic problems. A secondary objective is to generalize the computational resource for application to a broader scope of problems of interest to NASA. The three major elements of the NAS project are the NAS processing system network (NPSN), the NAS facility housing the system and support personnel, and NAS operations providing the required operations, maintenance, and services support for system development and normal production operation. The NPSN will be implemented in a four phased building block approach utilizing advanced state-of-the-art hardware and software either existing or currently in development The four phases are (1) network protocol development, (2) NPSN development system, (3) NPSN full system, and (4) NPSN upgrades This RTOP includes overall project planning, phase 1, phase 2 design, and ongoing operations support during development and normal operations It is anticipated that the implementation stages of phases 2 and 3 will be funded by a FY-84 new initiative outside of the scope of this RTOP

W83-70050 Langley Research Center, Hampton, Va COMPUTER-AIDED DESIGN R C Goetz 804-827-2042 (506-53-53)

The objective of the research is to exploit technical advances in computers to aid the engineering design and analysis process. The scope of the effort includes development of techniques of data base management for large-scale engineering design activities as well as the use of special purpose computer hardware and software to facilitate structural computations In FY-83, the IPAD (Integrated Programs for Aerospace-Vehicle Design) project will continue research on large-scale design data base management Efforts will be focused on the implementation and evaluation of techniques to handle basic geometry in a multi-schema (multiview) environment. On-going work will continue on the development of a Finite Element Machine (FEM), an array of microprocessors especially configured to solve structural analysis problems. In FY-83, a 16-processor configuration will be assembled and its capability to perform relaxation and matrix inversion solutions on structural problems will be investigated

W83-70051

505-37-20

505-37-13

National Aeronautics and Space Administration, Washington, D.C. AEROSPACE COMPUTER SCIENCE UNIVERSITY RESEARCH Ronald L Larsen 202-755-2364 (506-54-50)

The objective is to (1) develop university-based center for aerospace computing technology focusing on concurrent processing, highly reliable computing, and scientific and engineering information management, and (2) foster cooperative, coordinated research coupling computer science with aeronautics, astronautics, and space sciences

W83-70052

Ames Research Center, Moffett Field, Calif.

ADVANCED COMPUTATIONAL CONCEPTS

J O Arnold 415-965-6209

(506-54-51, 505-37-01, 505-31-01, 506-51-11, 506-53-11)

The objective is to systematically formulate and validate concepts of advanced computer architectures tailored to maximize computer power and cost effectiveness in the solution of large scale physical problems of growing interest to the agency Current focus is on computer systems optimized for computational fluid dynamics (CFD) and computational chemistry. In CFD, computer systems for research on flows about aircraft will be developed in computational chemistry, computer systems applied to the determination of properties from first principles of small molecules and clusters of up to 50 atoms will be developed. The approach is that selected computational physicists with extensive expertise in computer systems hardware and software will analyze requirements for their advanced problems which cannot be met by existing computational tools. They, in collaboration with computer scientists, will develop several ideas for potential computer architectures meeting these requirements. A concept will be validated by prototype modeling with inexpensive building blocks or by simulation on existing computers. Once validated the concept would be reported in the appropriate literature, management briefings, workshops and seminars Immediate advances in the agency's capability to solve large scale computational physical problems would be realized with implementation of the full scale system

W83-70053

505-37-31

505-37-21

Ames Research Center, Moffett Field, Calif CLASS VI COMPUTATIONAL CAPABILITY SUPPORT

D L Fisher 415-965-5015

The objective is to provide the research community at Ames with state-of-the-art computational tools which will enable the researchers, particularly in the computational physics community, to maintain their preeminence. This will be accomplished through a contract which provides total computational capability including all components of the computer systems, as well as design, development, maintenance and operational functions

W83-70054

505-37-32

Lewis Research Center, Cleveland, Ohio COMPUTATIONAL FACILITIES Ralph K Everett 216-433-6163

This RTOP covers the cost for lease, purchase, and maintenance of the hardware and system software for the high speed analytical processor (Cray 1S computer system) The system will be installed in the central computer facility with the existing IBM 370/3033 attached processor providing the input and output for the system. The system will be used primarily for scientific computation (math modeling) with the initial emphasis on analysis of aerodynamics, thermal, and structural performance characteristics of propulsion system components

Propulsion Systems Research and **Technology**

W83-70055

505-40-02

Lewis Research Center Cleveland Ohio INLETS AND NOZZLES

R E Coltrin 216-433-6820

(505-43-82 505-31-02, 505-43-22 505-43-42)

A comprehensive flow prediction methodology for the design of inlets and nozzles will be generated to achieve higher performance with increased propulsion system stability. Computer analysis programs for predicting internal and external flows will be synthesized in-house and by contracts and grants under RTOP 505-31-02. These programs will make it possible to analyze viscous and inviscid flows in two and three dimensions. Basic benchmark testing will be one to define detailed flow phenomena to guide and verify the analysis. Verification experiments will be conducted to verify accuracy of computer codes or design of actual components. Inlet and nozzle hardware will be designed and used to conduct exploratory research in areas that are not presently amenable to analysis. The effort in this RTOP was supported in FY-82 under RTOP 505-32-12 (Propulsion System Aerodynamics) In FY-83, RTOP 505-32-12 has been split into several RTOPs of which this RTOP is one

W83-70056

505-40-12

Lewis Research Center, Cleveland, Ohio FAN AND COMPRESSOR RESEARCH

C L Ball 216-433-6835

The objective is to improve efficiency, operating range distortion tolerance, durability, and reliability, and to reduce the weight, volume, and cost of fans and compressors. Increased emphasis is placed on fundamental high speed experiments to better understand the internal flow physics and to verify the internal flow analysis codes to improve the accuracy and reliability of the compressor design system. The advanced internal flow analysis methods will result in improved designs and large cost sayings by reducing the time required to incorporate advanced compressor technology into future engine development programs. A new thrust directed towards developing a fundamental understanding of compressor stalling phenomena and how it is influenced by compressor design parameters is being pursued. Models for predicting stalling characteristics and recovery of advanced compression systems will be developed Small compressor research is also being emphasized to provide advanced technology that is applicable to small as well as large propulsion systems

W83-70057

505-40-22

Lewis Research Center, Cleveland, Ohio COMBUSTOR\$ AND TURBINES
R A Rudey 216-433-6625
(505-31-42, 533-04-12)

The objective of this program is the improvement of performance, life, and reliability of combustors and turbines for civil and military applications. Combustor research will include anaytical model development and verification as well as the identification and evaluation of advanced combustor and fuel system concepts. The effects of fuel property variations on the performance, reliability, and durability of fuel system components will be investigated and advanced fuel system concepts will be identified and evaluated that enable the use of broader property fuels. Turbine research will involve improved cooling and aerodynamic design methods for axial and radial turbines. This work, in conjunction with related programs in fundamental analysis and experiments and hot section technology, will result in large cost savings by reducing the time required and the risk involved in incorporating advanced components into future engine development programs

W83-70058

505-40-32

Lewis Research Center, Cleveland, Ohio

PROPELLER RESEARCH

D C Mikkelson 216-433-6820

(535-03-12, 505-31-02, 505-32-02, 505-41-43)

The objective of the Propeller Research Program is to advance the technologies which are critical to efficient, acceptable propeller propulsion both at high subsonic speeds (Mach 07 to 08) and at lower speeds typical of business aviation and small short haul aircraft. This objective will be accomplished by conducting analytical and experimental investigations of advanced propellers incorporating integrated aerodynamic, acoustic, and aeroelastic design for flutter-free operation at both high subsonic flight conditions (up to Mach 0.8 and 35,000 feet altitude) and low speeds (Mach 0.6 and below). Acoustic characteristics will be evaluated for both advanced high tip-speed propellers and advanced low speed propellers. Analytical and experimental investigations will be conducted to maximize the performance and minimize flow interactions involving propeller, slipstream, core inlet, and nacelle

W83-70059

505-40-42

Lewis Research Center, Cleveland, Ohio POWER TRANSFER RESEARCH

E V Zaretsky 216-433-6101

The objectives of this work are to advance the state-of-the-art in the technology of transmissions and of mechanical components such as bearings and gears. Goals are to achieve improved component performance, life, noise, weight, reliability, and efficiency in the high temperature and high speed environments of turbojet and turbofan engines and mechanical power transmission systems for helicopters, V/STOL, and turboprop application Emphasis will be given to analytical performance predictions with experimental verification to create far term opportunities as well as to satisfy goals for both improved component and system performance Experimental studies will be performed with standard type transmissions with improved bearing and gear components and with advanced hybrid and traction transmissions using traction contacts Materials, lubricants, and design variables will be studied for improved component and system reliability and life

W83-70060

505-40-52

Lewis Research Center, Cleveland, Ohio CONTROLS AND INSTRUMENTATION

N Wenger 216-433-4000

(505-31-52, 505-34-02, 506-54-12)

The objective of this RTOP is to both develop and apply advanced in instrumentation and measurement systems for use in component research, engine systems research, and eventually in operational systems The research is focused on developing a technology base for producing high temperature transducers and electronic systems that can operate uncooled on or in close proximity to a turbine engine for the purposes of control, condition monitoring, or experimentation. The applications part of the RTOP is focused on further development and demonstration of state-of-the-art prototype instrumentation in LeRC experimental facilities. Major emphasis in the applications area is the use of microcomputers and minicomputers for the automation of instrument with respect to operation, calibration, and pre-run checkout Another objective is to improve the understanding of propulsion system dynamics and to provide an improved technology base for future engine control system development Experimental and analytical efforts are undertaken to support the various technical disciplines associated with the dynamics and control of propulsion systems. Real-time dynamic simulations of propulsion systems are developed using hybrid computers Research into the use of parallel microprocessors for real-time simulation is also conducted. Innovative propulsion control components are developed, with emphasis on electro-optical sensors and actuators Analytical and experimental research is conducted on post-stall engine system dynamic behavior Control modes for avoidance of and recovery

from rotating stall are synthesized and evaluated using simulations and

engines

505-40-62

Lewis Research Center, Cleveland, Ohio ENGINE SYSTEMS RESEARCH

W T Wintucky 216-433-6946

One objective of this RTOP is to improve the understanding and technology base of propulsion system behavior and establish analytical engine dynamic prediction techniques Dynamic research and studies will be conducted on advanced civil and military engines on component interactions, flow distortions, system stability, and stall recovery on system behavior and performance Studies will be made of component and system performance for improving fuel economy and defining engine system behavior in the over 50 Hz frequency. In addition, the research will define and establish the technology base for the most promising advanced small engines for future small engine, commuter, rotorcraft, and light military aircraft for the late 1980's and on The advanced engines having multifuel capability, substantially lower BSFC, weight, maintenance and improved reliability are being defined through studies and engine tests, supplemented by analyses and experimental investigations in key technology areas. A final objective will be to perform studies of the feasibility and potential benefits of advanced propulsion concepts, to identify technology research requirements, and define opportunities for capitalizing on technology advances. Studies will be performed of engine cycles, propulsion systems, and engine/airframe combinations in aircraft missions

W83-70062

505-40-70

Lewis Research Center, Cleveland, Ohio ENGINE SYSTEMS FACILITIES OPERATIONS

J A Yuska 216-433-6898

This RTOP covers the operation, maintenance, repair, and improvements of the Propulsion System Laboratory (PSL) and the engine static test stands (ECRL-2 and Vertical Lift Fan Facility (VLFF)) at LeRC The PSL complex consists of two altitude test chambers, designated as PSL-3 and PSL-4 The ECRL-2 is an indoor static stand and VLFF is an outdoor static stand. The objective is to provide safe and productive operations of the engine test facilities for propulsion and aerodynamic systems research and technology directed towards improving systems technology for future turbofan, turbojet, and turboshaft engines. This will be accomplished through the application of research sub-programs to advanced civil and military engines. This RTOP covers the cost of operating PSL, ECRL-2, and VLFF in support of the above research plus the cost of maintaining, repairing, and assuring the safety of these major facilities. Funding for improving the facilities capabilities, maximizing the productivity, and improving energy efficiency are also included

W83-70063

505-40-72

Lewis Research Center, Cleveland, Ohio WIND TUNNEL OPERATIONS

A J Gnecco 216-433-5579

This RTOP covers the cost of maintenance, normal repair, and limited improvements of all the wind tunnel facilities at LeRC These

facilities consist of the 10x10 foot supersonic wind tunnel, 8x6 foot supersonic wind tunnel, 9x15 foot low speed wind tunnel, and the 6x9 foot icing research tunnel (IRT). The costs of operating the wind tunnels during research testing and to prepare the tunnel for specific research tests are not covered under this RTOP

Rotorcraft Research and Technology

W83-70064

505-42-11

505-42-23

Ames Research Center, Moffett Field, Calif

ROTORCRAFT AEROMECHANICS AND CONFIGURATIONS D H Hickey 415-965-5036 (505-42-11, 532-03-11, 532-06-11)

This RTOP covers research on rotor aerodynamics, dynamic loads and stability, performance and noise characteristics, rotorcraft flight dynamics and rotorcraft human factors Theoretical and experimental research will be conducted to improve fundamental understanding and develop techniques to design rotors optimized for aerodynamic performance and noise reduction. These techniques will include the effects of planform geometry, airfoil section, dynamic stall and wake induced inflow Analytical models for the flow about rotorcraft fuselages, including wake interaction, will be developed. The understanding and predictive capability of the aerodynamic and dynamic phenomena of advanced rotorcraft will be improved by conducting analytical, small scale, and full scale experimental investigations of helicopter performance and noise, rotor aerodynamics and wake characteristics, drag and aerodynamic interference and rotor loads, vibration and vibration reduction systems Specific advanced rotor configurations will be tested in the full scale wind tunnel Flight dynamics research will be conducted to provide handling qualities and design criteria for specific missions. The research will be conducted through analysis, including math model improvement and development of advanced techniques of control system implementation, ground based piloted simulation, and flight research with the UH-1H (with V/STOLAND), and CH-47 Human factors research will concentrate on fundamental laboratory studies to reveal the needs and information processing of helicopter pilots. In particular, studies will continue on auditory signals to provide important pilot cues, the use of peripheral vision, and an evaluation of workload measurement techniques

W83-70065

Langley Research Center, Hampton, Va ROTORCRAFT AIRFRAME SYSTEMS

Robert C Goetz 804-827-2042

(532-06-42)

The technology for the application of composite materials and design concepts in helicopter structures to improve performance and efficiency, reduce costs, and provide durability and energy absorption capability equivalent of metal structures will be developed through in-house and contractual studies. Long-term durability of Kevlar secondary structures and graphite primary structures will be determined through flight service and structural testing studies. Impact dynamics characteristics of composite structures will be evaluated. Through analysis, wind tunnel, and flight studies, effective means for reducing helicopter vibrations, improving performance, and evaluating aeroelastic characteristics of new rotor systems will be determined. Active higher harmonic control of vibrations will be demonstrated in flight Improved predictive methods for analysis of the unsteady airloads on rotors will be developed through in-house and contract studies. Analytical and experimental studies will be made to identify significant factors contributing to the aerodynamic, acoustic, and aeroelastic characteristics of rotors

W83-70066 505-42-32

Lewis Research Center, Cleveland, Ohio **ROTORCRAFT-OPERATING PROBLEMS** N E Samanich 216-433-6604

(505-42-21, 505-42-31, 530-02-11, 505-44-12, 511-58-12)

Part of the NASA rotorcraft program is aimed at advancing technology in engine components, transmissions and propulsion system integration. Objectives are to improve propulsion system durability, reliability and cruise fuel consumption, to reduce life cycle costs, to develop propulsion technology unique to high productivity vehicles, and to increase operational capability and flexibility. Because of recent funding cutbacks, it has become necessary to transfer all generic small engine component efforts to the R&T division of OAST Future work is being directed toward solving the unique operating problems of military and civil rotorcraft with particular emphasis on propulsion technology and icing Recent and planned activity encompasses studies optimizing propulsion systems for high speed rotorcraft, evaluation of various contingency power concepts with some verification testing, full authority digital electronic controls research and studies of methods to improve

part power efficiency. Power transfer technology is directed toward improving large gear analyses techniques along with examining new concepts which could improve efficiency, reliability, and reduce weight and noise Although there is some work continuing involving inlets, rotorcraft icing research is aimed primarily at establishing and verifying analytical methodology for use in rotor ice prediction and ice protection systems

W83-70067

505-42-81

Ames Research Center, Moffett Field, Calif LOW SPEED WIND TUNNEL OPERATIONS

V Kirk 415-965-5045

This RTOP covers support and operation of the National Full Scale Facilities Complex (40- by 80-foot wind tunnel, 80- by 120-foot wind tunnel, and the Outdoor Aerodynamic Research Facility) and the 7- by 10-foot wind tunnel number one. The objective of this RTOP is to support research on basic fluid mechanics, rotorcraft aeromechanics and acoustics, V/STOL aerodynamics, and the high-lift aerodynamics of conventional aircraft. The 40- by 80-foot wind tunnel is operational and the 80- by 120-foot wind tunnel will become operational in the second quarter of FY-83 Early research programs in the 40- by 80include the bearingless main rotor, rotorcraft interactional aerodynamics, and high angle-of-attack research. First research programs in the new 80- by 120- include the tilt nacelle turbofan V/STOL model and the DeHavilland augmentor V/STOL model The 40- by 80-/80- by 120-foot wind tunnel is scheduled for a combined 1.5 shift per day occupancy The outdoor aerodynamic research facility (OARF) and the 7- by 10-foot wind tunnel are scheduled for a combined one shift per day occupancy Variable frequency power (150 HZ) is being installed at the OARF to allow rotor research at this facility. Delivery of a rotor test rig for the 7- by 10- will allow increase rotor testing in that facility. A new control room and wind tunnel balance improvements will increase the efficiency of the tunnel Research investigations at the OARF in FY-83 include rotor noise, rotorcraft interactive noise, the tilt nacelle V/STOL, and VEO/V/STOL nozzle, while the 7- by 10- programs include forward swept wing, rotor noise, and high lift investigations

High-Speed Aircraft Research and **Technology**

W83-70068

505-43-01

Ames Research Center, Moffett Field, Calif

GEODYNAMICS/FLIGHT DYNAMICS OF POWERED LIFT VEHICLES

Bedford A Lampkin 415-965-6039

The objective of this RTOP is to develop basic research and technology required to enable the development of military and civil aircraft having V/STOL and STOL capability and viable mission performance Theoretical and experimental generic research will be undertaken in the areas of high-speed aerodynamics, low-speed aerodynamics, and flight dynamics. To ensure that all major high-speed propulsion system/airframe interactions are accounted for properly. compact propulsion simulator technology will be developed for use in scale wind tunnel models of powered lift configurations. Methods or predicting high-speed aerodynamic performance will be refined Low-speed wind tunnel aerodynamic research will continue to develop aerodynamic prediction techniques for both transition and ground effects The experimental data base will be expanded using large-scale components and complete models. Research will also include improvement of experimental techniques and evaluation of ejector thrust augmentation Flight control system and display requirements will be investigated concurrently, primarily through piloted simulation and through flight research in collaboration with the Royal Aircraft Establishment of the U K in conjunction with the NASA/MOD (PE)

W83-70069

505-43-02

Lewis Research Center, Cleveland, Ohio POWERED LIFT PROPULSION TECHNOLOGY

L W Gertsma 216-433-5165

An efficient, lightweight, reliable propulsion system is a critical requirements for the successful design of powered lift aircraft. The technology base for the propulsion system will be developed in selected critical areas which are unique to the powered lift concept Analytical and experimental investigations will be conducted in the areas of inlets, thrust deflector nozzles, and thrust control devices operating in the hover and transition modes for both subsonic and supersonic propulsion system concepts

W83-70070 505-43-11

Ames Research Center, Moffett Field, Calif
HIGH PERFORMANCE AIRCRAFT FLIGHT DYNAMICS AND
FLYING QUALITIES

G N Malcolm 415-965-6266

(505-31-21)

The objective of this effort is to provide a basic understanding of the aerodynamic, flight dynamic, and flying qualities of highly maneuverable, high performance aircraft through the development and utilization of improved wind tunnel and flight test measurement and analytic techniques. Ultimately, through application of improved methods of testing and application of results (including better simulations resulting from improved aerodynamic mathematical models and flight validated data bases), criteria can be established for designing vehicles with improved flying qualities over an expanded angle of attack and Mach number envelope Various wind tunnel experimental capabilities for determining aircraft and dynamic characteristics are being investigated, including all phases of high-maneuver flight from controlled motions to fully developed spins Emphasis on test capabilities at high Reynolds numbers is particularly important in order to achieve realistic correlation with flight test results. Studies are underway to improve analytical techniques for determining stability and control derivatives from flight data and to develop new techniques for evaluating handling qualities. Improved techniques will be studied to estimate the unknown aerodynamic parameters of the aero/math model and to improve the identifiability of the system parameters from flight data. A coordinated program of wind tunnel and flight tests is planned to provide validation of aerodynamic math models

W83-70071 505-43-13
Langley Research Center, Hampton, Va
HIGH PERFORMANCE AIRCRAFT FLIGHT DYNAMICS &
CONTROLS

R E Bower 804-827-3285

The broad objectives are to improve the stall/spin characteristics of high performance aircraft, and to determine and evaluate architecture of integrated digital airframe/propulsion control systems for such vehicles Specific objectives of the stall/spin research are (1) to investigate the fundamental nature of stall/spin including the development of test techniques and theoretical methods, (2) to develop and evaluate automatic spin prevention concepts (3) to determine static and dynamic aerodynamic characteristics at high angle of attack, and (4) to determine geometric characteristics which result in inherent spin resistance. Methods of approach for these efforts include static and dynamic wind tunnel force tests, theoretical analysis, piloted simulator tests, and dynamic model flight tests. Extensive participation in DOD airplane programs is involved Specific objectives of the integrated controls research are (1) to assess the benefits/disadvantages of system architectures with airframe/propulsion control coupling. (2) to identify key hardware elements requiring development to insure availability for advanced applications, (3) to design, build, and evaluate the selected systems, and (4) to assess the need for flight tests demonstration. The system evaluation research will be conducted in the Langley Avionics Research Laboratory The controls program is directed by the Langley Center with technical assistance by the Lewis Research Center

W83-70072 505-43-22
Lewis Research Center, Cleveland, Ohio
NON-AXISYMMETRIC NOZZLE RESEARCH

R G Willoh 216-433-6624

The objective is to establish, through analytical studies and system design efforts, as well as model and full-scale experimental research programs, the technology base required for the application of original configurations to future combat aircraft. The Lewis effort is focused on internal flow of non-axisymmetric exhaust systems. Current activities are specifically directed toward providing the technology required for the design of non-axisymmetric exhaust nozzles for turbine engines The high maneuverability and STOL requirements anticipated in future aircraft designs lead to the application of non-axisymmetric nozzles capable of thrust vectoring and reversing Principal areas of concern will include cooling, heat transfer, structural design, weight, and internal aerodynamics. The objectives will be accomplished through contract and in-house studies, nozzle design, and experimental research. Particular emphasis will be placed on solutions to the complex cooling, structural and internal aerodynamic problems associated with non-axisymmetric nozzles Close coordination will*be maintained with Langley Research Center, the Navy and the Air Force to assure that work in the propulsion area appropriately supports DOE Requirements and the aerodynamic work at Langley

W83-70073 505-43-23

Langley Research Center, Hampton, Va
HIGH-SPEED AERODYNAMICS AND PROPULSION INTEGRATION

Roy V Harris, Jr 804-827-2658

The technical objective of this work is to develop the aerodynamic technology base for the design of future military aircraft and missile concepts. Analytical and experimental studies will be made to develop aircraft design rationale and evaluate advanced aerodynamic concepts such as supercritical aerdynamics, wing warp, maneuver devices, thrust-induced lift, nonaxisymmetric nozzles, and component interference. Similar studies will be made to extend the aerodynamic technology base for missile systems including conventional cruciform stability and control concepts, airbreathing propulsion integration, and monoplanar concepts. Studies will also be made to provide a technology base for evaluation of missile carriage and separation aerodynamics.

W83-70074 505-43-31

Ames Research Center, Moffett Field, Calif

INTERAGENCY ASSISTANCE AND TESTING - DRYDEN

R G Bryant 805-258-3311

This RTOP is intended to cover interagency and intercenter assistance using applicable Dryden flight test facilities. The broad objective is to provide technical assistance, consultative services and test facility support to DoD for military programs and to industry and other NASA Centers, which involve specific requests for NASA support. Past activities of this kind include a B-52 drop test for recertification of the F-111 crew escape system, component improvement tests involving F-15, T-37, F-111 aircraft and support of the AFTI/F-16 program. Some current activities include conduct of Air Force F-111 crew module recovery system tests and planning for Marshall Space Flight Center solid rocket booster recovery system tests. Analysis of test results will be performed and selected results will be documented. Consultation will include participation in pre-test conferences, technical evaluation boards, and technical coordination committees.

W83-70075 505-43-32

Lewis Research Center, Cleveland, Ohio
INTERAGENCY & INDUSTRIAL ASSISTANCE & TESTING
A J Gnecco 216-433-5579

The objective of this RTOP is to support requests from DOD, FAA, other Federal agencies outside NASA and the aircraft/missile industry for aerodynamic testing in facilities at the Lewis Research Center. The facilities typically used under this RTOP include 10 x 10 SWT, 8 x 6 SWT, 9 x 15 WT, icing tunnel, and PSL Additional support is also provided in the form of technical assistance, consultative services and participation in the technical evaluation of developing aircraft and missile concepts.

W83-70076 505-43-33

Langley Research Center, Hampton, Va
INTERAGENCY AND INDUSTRIAL ASSISTANCE AND TESTING
Roy V Harris, Jr 804-827-2658

The broad objective is to provide technical assistance and consultative services to outside agencies and aircraft industry programs which involve specific requests for NASA support. The principal assistance is to the Department of Defense for aircraft and missile development programs. Currently, activity is focused in the areas of stall/spin, aerodynamic characteristics at subsonic, transonic, and supersonic speeds, flutter and aeroelasticity, structures, landing loads, simulation and propulsion system interactions on airframes and nozzles. The approach will involve tests in applicable Langley facilities consistent with the availability of test time and the utilization need for the particular facilities requested. Analysis of test results will be performed and selected results will be documented. Consultation will include participation in pretest conferences, technical evaluation boards, and technical coordination and oversight committees.

W83-70077 505-43-42

Lewis Research Center, Cleveland, Ohio
SUPERSONIC PROPULSION INTEGRATION TECHNOLOGY
R E Coltrin 216-433-6820

(505-40-02, 505-43-82, 505-31-02, 505-43-22)

A technology data base for high-speed military and civil aircraft design concepts incorporating improved propulsion system/airframe integration techniques will be generated Present high speed inlet/engine/nozzle/airframe integration concepts and methods will be evaluated and the generation of advanced concepts and methods will be initiated linlet aerodynamic, stability, and control analysis/design methods will be assembled and evaluated Existing inlet or nozzle hardware will be modified or new hardware will be built and tested to verify aerodynamic and control analysis methods and to provide a data base for areas

such as low speed aeroacoustics and the variale diameter centerbody inlet concept. These studies and tests will be conducted both in-house and on contract or grant.

W83-70078

505-43-43

Langley Research Center, Hampton, Va SUPERSONIC AERODYNAMICS, CONFIGURATIONS, INTEGRA-TION, STRUCTURES & MATERIALS TECHNOLOGY

D J Maglieri 804-827-3838

The objective of this RTOP is to develop a technology data base for high-speed military and civil aircraft design concepts of advanced configurations incorporating improved aerodynamic performance, propulsion system/airframe integration techniques, and structures and materials. This will be accomplished primarily through in-house studies and experimentation to (1) establish a supersonic aerodynamic technology base permits improvements in L/D, reduction in drag, refinement of aircraft concepts, and optimization of aircraft characteristics over the full operating speed range, (2) evolve and refine advanced military and civil aircraft configurations that provide advancements in performance, range, speed, volume, boom signature, fuel consumption, etc. and (3) establish a high temperature structures and materials technology base that permits significant reductions in structural weight by research on new materials, structural design, and fabrication techniques providing satisfactory fatigue, fracture, and thermal/cyclic life characteristics under high speed flight conditions

W83-70079

505-43-61

Ames Research Center, Moffett Field, Calif HIGH-SPEED WIND TUNNEL OPERATIONS

Daniel P Bencze 415-965-5848

This RTOP covers the operation, maintenance, repair, and enhancement of the high speed wind tunnels at ARC. These facilities consist of the unitary plan wind tunnels (11-foot transonic, 9-by 7-foot, and 8-by 7-foot supersonic), 12-foot pressure wind tunnel, 2-by 2-foot and 14-foot transonic wind tunnels, and the 6- by 6-foot supersonic wind tunnel In addition, a number of smaller scale aerodynamics research and test facilities are maintained and supported as required. The objective of the RTOP is to provide aerodynamic testing in support of research and technology programs for NASA, DOD, industry, and other government agencies. Wind tunnel tests will be conducted to generate experimental test data to advance the state of the art in generic research and vehicle configuration research. In addition, facility enhancements and modifications are developed and implemented to meet the testing requirements of the industry and to maximize the energy efficiency and productivity of the facilities. The facilities themselves are maintained on a scheduled basis and repaired as required to maintain the desired level of testing and ensure continued safe operations

W83-70080

505-43-81

Ames Research Center, Moffett Field, Calif
HYPERSONIC AERONAUTICS TECHNOLOGY

Berwin M Kock 805-258-3311

The hypersonic vehicle program is conducting research addressing the technology needs of long range cruise airplanes designed to operate at Mach numbers in excess of 3.0. The YF-12 research program provided an engineering data base that is supportive of the hypersonic program. The focus of this RTOP is to apply that data base, as well as the experienced engineering personnel, to the aerodynamics, propulsion, structures and airplane operational disciplines for hypersonic vehicles. Analysis and laboratory testing will be provided. Dryden activities are in support of program lead by the Langley and Lewis Research Centers.

W83-70081

505-43-82

Lewis Research Center, Cleveland, Ohio

HYPERSONIC PROPULSION INTEGRATION TECHNOLOGY
R E Coltrin 216-433-6820

(505-43-42, 505-31-02, 505-40-02)

A program of applied research will be conducted to develop key propulsion and propulsion airframe integration technologies for application to air-breathing aircraft in the Mach 3-5 flight regime. A data base of performance and operational characteristics for advanced supersonic/hypersonic propulsion (inlet/engine (s)/airframe) concepts will be generated. Current inlet analytical prediction methods will be evaluated using this data base. Key propulsion barrier technologies will be identified for further investigations. These studies will be conducted inhouse and on contract and is a joint LaRC/LeRC program.

W83-70082

505-43-83

Langley Research Center, Hampton, Va

HIGH SPEED (SUPER/HYPERSONIC) TECHNOLOGY

V Harris, Jr 804-827-2658

The program is aimed at fundamental aerodynamic, propulsion, and

structures technologies to support future development of airbreathing aircraft and missiles in the Mach 3 to 7 class. The NASA in-house research capabilities and facilities will be utilized, supplemented by selected contracts and grants, to develop and combine critical methodologies. The aerodynamics effort will concentrate on propulsion/ airframe integration aspects of hypersonic configurations, including the forward aircraft flow field, spillage effects, and exhaust nozzles for multicycle turboramiet engines. Scramiet propulsion research will consist of combustion fundamentals for hydrogen and hydrocarbon fuels to include analytical techniques and flow field diagnostics, and of component and engine testing of investigate feasibility for the Langley airframe-integrated modular scramjet concepts. The structures focus will be on the testing of titanium sandwich panels for the wing skin of Mach 5 aircraft (at Dryden), on scramjet fuel injector strut design and fabrication, and on concepts applicable for methane fueled engines. The approach will combine the development and application of advanced analytical methods with representative experiments. A parametric range of geometric shapes will be addressed to identify the best fundamental approaches to high vehicle, engine, and structures performance. Detailed flow field analyses will include parabolic and elliptic three-dimensional techniques, embedded shocks, inlet spillage effects, shock boundary layer interactions, fuel injection, mixing, and combustion

Subsonic Aircraft Research and Technology

W83-70083

505-45-01

Ames Research Center, Moffett Field, Calif
B-57B FLIGHT INVESTIGATION OF ENVIRONMENTAL HAZARDS

W D Painter 805-258-3311

The objective of this work is to support the improvement of the definition of atmospheric characteristics required for advanced aircraft design and for more efficient, safe aircraft operation. Phenomena which are emphasized include clear air turbulence, wind shear, temperature transients, pressure altimetry problems and aircraft icing. Data on these phenomena are obtained from an instrumented B-57B aircraft and are related to the meteorological conditions causing them by the use of mathematical models and climatological information. This work will be covered by study efforts, both in-house and on contracts or grants from NASA Marshall Space Flight Center (MSFC) as well as the development and acquisition of sensors needed to measure the atmospheric phenomena. Results of this work are applicable to aircraft system design, flight test activities, and flight operations.

W83-70084

505-45-02

Lewis Research Center, Cleveland, Ohio

AIRCRAFT ICING RESEARCH

J J Reinmann 216-433-5542

The objective of this program is to update and advance the technology related to the safe operation of aircraft in atmospheric icing conditions. The program addresses the ice protection needs of general aviation, light transports, commercial transports, and helicopters. The program is broadbased, encompassing both analytical and experimental research, and is conducted using in-house, contracted, and university effort licing R&D testing will be conducted in the NASA-Lewis licing Research Tunnel, and in flight tests in natural icing clouds and behind icing cloud simulators. The research will be coordinated among the aircraft industry/users, civilian government agencies, and the military NASA will serve as the focal point for assembling and disseminating a wide range of data.

W83-70085

505-45-03

Langley Research Center, Hampton, Va

AVIATION SAFETY: SEVERE STORM HAZARDS

J W Stickle 804-827-2037

The aim is to improve the knowledge and understanding of atmospheric processes as they affect the design and safe and efficient operation of aircraft and aircraft systems. Experimental and analytical programs will be structured to provide data on and new methods for improving the predictability, detection, and avoidance of severe storm hazards, and basic data for the design for those hazards which cannot be avoided. Specific hazards are precipitation (amount and kind), wind and wind shear, turbulence, and in-flight lightning.

W83-70086

505-45-05

Jet Propulsion Laboratory, Pasadena, Calif.

CLEAR AIR TURBULENCE STUDIES USING PASSIVE MI-CROWAVE RADIOMETERS

B L Gary 213-354-3198

This RTOP is for continuation of a flight evaluation of the 'clear air

turbulence' airborne microwave radiometer (AMR). The AMR is installed in the NASA/Ames C-141 'Kuiper Airborne Observatory' The instrument uses passive remote sensing techniques to determine altitude temperature profiles, which cover a 6000 ft altitude region centered on the aircraft's altitude These profiles can be used to locate tropopause and inversion layer features Clear air turbulence, CAT, is generated at the tropopause and within inversion layers. Although it is 'felt' at other altitudes, CAT severity is strongest at the altitudes where is is generated. Thus, knowledge of the altitude of the tropopause (or an inversion layer) is equivalent to knowledge about where CAT is most likely to be generated (and to be most severe) If CAT is being felt, or if it is expected (based on 'pilot reports', or another sensor's 'when' prediction), the AMR provides a basis for requesting altitude changes that may reduce the severity of the CAT encounter. The principal objective of the RTOP is to obtain flight statistics on the occurrence of CAT at the tropopause, within inversion layers, and at other altitudes. These statistics will enable an evaluation to be made of the merits of using the AMR as a CAT avoidance sensor

W83-70087 505-45-09

Marshall Space Flight Center, Huntsville, Ala SAFETY - ATMOSPHERIC PROCESSES Dennis W Camp 205-453-2087

The objectives are to (1) define, investigate, and model atmospheric conditions having adverse effects on aircraft operations relative to efficiency and safety. (2) conduct research relative to the development of techniques and procedures for enhancing safe and efficient operations of aeronautical systems, and (3) development and/or improve meteorological instrumentation and methods as needed to accomplish the first two objectives. The variation in atmospheric backscatter at CO2 lower wavelengths (9 to 11 microns) and effect on the performance requirements for operational aircraft systems will be studied. Enhancement of lidar velocity signals will be investigated. The approach will be to continue to (1) measure and analyze atmospheric data, (2) develop models of atmospheric boundary layer properties and conditions which lead to or intensify them, (3) perform analytical and field tests relative to investigating warm fog dispersal, and (4) develop and/or modify instrumentation as needed to meet requirements of this approach. To accomplish the objectives, the following tasks will be performed correlation of lateral and longitudinal gusts, atmospheric dynamics processes definition, warm fog dispersal, characterization of atmospheric electrical phenomena, applied laser technology, analysis of Doppler lidar measured winds, conduction of aviation meteorology workshop and interagency meteorology retreat, investigation relative to needed new and/or improved instrumentation and methods for safety and efficiency of aeronautical systems, and interagency wind shear research (JAWS)

W83-70088 505-45-11

Ames Research Center, Moffett Field, Calif

OPERATIONAL PROBLEMS FIREWORTHINESS AND CRASHWORTHINESS

C T Snyder 415-965-5009 (505-33-31)

One objective of this RTOP is to improve aviation safety by increasing understanding of the causes of accidents, and by developing systems technology and piloting techniques for avoiding hazards. Research on post-accident analysis techniques is a cooperative program with the National Transportation Safety Board (NTSB) Research will also be conducted in a technology to reduce the hazards associated with wind shear and to enhance the operational safety of IFR operations for civil and military rotorcraft and V/STOL aircraft. A second objective of this RTOP is to improve aircraft crashworthiness and cabin safety in post-crash fires The program includes (1) development of a cost beneficial survivability model for aicraft fire safety, (2) fuel anti-misting studies and the determination of fluid properties of modified jet fuel for inhibiting the ignition of fuel. (3) development of fire retardant and crashworthy composites for interior applications such as aircraft seats. (4) development of lightweight graphite composites for fire-resistant aircraft interiors, (5) development of fire test methodology such as measurement of the mass injection rate of materials into the environment, (6) fabrication of advanced aircraft interior materials for testing by the FAA, and (7) full-scale demonstration of the technologies for improved survivability

W83-70089 505-45-15

Jet Propulsion Laboratory, Pasadena, Calif

AVIATION SAFETY TECHNOLOGY - APPLIED FLUID MECHANICS/ FIRE MATERIALS MODELING

Lloyd Back 213-354-3537

The overall objective of this effort is directed toward improving aircraft fire safety. The studies include those aspects of safety associated with (1) experimental investigations to study the ignition and flame spread characteristics of aircraft ceiling panels, and the interaction

between a pool fire and ventilation crossflow in a one-third scale aircraft cabin simulation, and the evaluation and development of a detailed enclosure fire dynamics model, utilizing the JPL pool fire and flame spread test facility, (2) the development of a detailed fire modeling methodology for the prediction of aircraft fire characteristics, and (3) thermochemical modeling of burning materials

W83-70090 505-45-17

Lyndon B Johnson Space Center, Houston, Tex AIRCRAFT FIRE SAFETY MATERIALS TESTING

D E Supkis 713-483-3211

This RTOP consists of work originally started in FY-75 and continued through FY-81. The RTOP provides for developing and testing new, lightweight, fire-retardant, nonmetalic materials, continuing development and characterization of polyimide end items, developing secondary aircraft structures, the fabrication of modules for in-house testing, testing by the aircraft industry and by FAATC, toxicity support for evaluation of candidate state-of-the-art materials, and for providing manpower support for these various tasks including delivery of technical data and reports.

W83-70091 505-45-22 Lewis Research Center, Cleveland, Ohio

AIRCRAFT FUEL EFFICIENCY IMPROVEMENT

D L Nored 216-433-6948

Results from Phase I indicate that if the detail implicit in high-resolution windfield and temperature data can be retained, fuel savings of between 2 and 4 percent are possible. The objective of Phase II will be to evaluate those technologies which offer the most promise in translating this potential fuel savings to operational status to meet the needs of the United States aviation industry. To achieve this objective, the use of man-computer interactive video techniques will be applied to the development of a high-resolution wind-and temperature-data base at cruise altitudes. This data base, consisting of satellite, aircraft, radiosonde, and numerical-weather-prediction model data, when optimized through human/computer interactive methods, will be evaluated against the present operational data base as well as against actual data.

W83-70092 505-45-23 Langley Research Center, Hampton, Va

Langley Research Center, Hampton, Va AIRCRAFT LANDING DYNAMICS

R C Goetz 804-827-2042

The objective of the research is to measure the landing environment and the dynamic response of advanced landing systems to provide technology for safe economical all-weather aircraft ground operations The scope of the effort includes investigation of the dynamics of tires and air cushions, braking and steering response of advanced systems, as well as definition of landing hazards such as low altitude turbulence, runway slipperiness, and tire blowouts. In FY-83, efforts to develop and confirm analytical tire models will continue. Based on new test data, efforts will be made to develop software simulations of antiskid braking dynamics to support landing gear design and for application to aircraft ground-handling simulators. In air cushion landing system research, air cushion stability analysis will be refined and methods of braking and steering will be investigated. Work will continue to upgrade the Aircraft Landing Dynamics Facility to accommodate significantly higher landing speeds in landing hazard work, in-flight, low altitude turbulence measurements will be made during approach and landing conditions to improve understanding and modeling of turbulence hazards. Also, runway friction measurement research related to aircraft stopping performance will continue

W83-70093 505-45-43
Langley Research Center, Hampton, Va
AERODYNAMICS/PROPULSION INTEGRATION

R E Bower 804-827-3285

An advanced technology base will be developed for subsonic aircraft to improve safety and productivity, lower cost, and reduce performance losses that are associated with integration of propulsion systems and airframes. The technology base will be applicable to both military and civil subsonic aircraft, but will be focused on vehicles having operating characteristics and environments of large transport airplanes, commuter aircraft, and general aviation airplanes. The research will involve analytical and experimental investigations beginning at the first level of integration (that is, wings-fuselages, wing-nacelles) and progressing toward more complete configurations with the objective to understand the behavior of attached and separated flows and assess the behavior in terms of its impact on performance and stability and control. The work will be accomplished through computer analysis, simulator studies, and wind tunnel and flight tests of model and full scale aircraft.

Aeronautics Systems Technology Programs Rotorcraft Systems Technology

W83-70094 532-01-11
Ames Research Center, Moffett Field, Calif
ROTORCRAFT FLIGHT GUIDANCE SYSTEMS TECHNOLOGY
J. S. Bull 415-965-5425

The objective of this research is to provide the critical technology needed to significantly improve rotorcraft operational capability under instrument meteorological conditions (IMC) The program goal is to achieve rotorcraft mission productivity under IMC conditions equivalent to that under visual meteorological conditions (VMC) In accomplishing the program objective and goal, it is expected that system safety will also be enhanced. The research program will be based upon the needs, requirements, and operating experience of the sers, in coordination with the DOD, FAA, and industry. The design criteria and performance tradeoffs for rotorcraft all weather system concepts will be defined, implemented, and evaluated through simulations, flight research, and operational flight assessments There are three main rotorcraft all weather system technology thrusts (1) the development of design criteria and performance tradeoffs for promising remote site guidance concepts. (2) the definition of operational and performance limitations of curved, segmented, and decelerating rotorcraft approaches to a helipad in proximity to a microwave landing system installation and (3) the development of crew station design criteria for advanced all weather integrated guidance and control system concepts. The basic compatibility between the guidance systems and the aircraft performance and control capabilities will be considered in all these activities to properly focus the research

W83-70095
Ames Research Center, Moffett Field, Calif
RSRA FLIGHT RESEARCH/ROTORS

W J Snyder 415-965-6570 (532-06-11, 505-42-21)

(505-34-11, 532-06-11)

Research conducted under this program will provide and validate integrated rotor system technology required to substantially improve the performance, utility, efficiency, dynamics, noise, maintainability, and ownership cost of civil and military helicopters. The objectives of this RTOP are to provide and validate integrated rotorcraft and rotor systems technology required for the low risk design of advanced rotorcraft systems and components based on verified design tools and experimental methods Program emphasis is on rotor system performance, rotor/ airframe aerodynamics and aeroelastic methodology, vibration prediction and control, noise prediction and control, advanced materials application, advanced rotor control concepts, and advanced vehicle concepts which have significant potential gains in utility, efficiency, maintainability, and productivity The activity involves system design studies and focused and coordinated research in analytical prediction methods, simulation, ground testing, and flight testing of current state of the art rotors and advanced concept rotor systems. This program is in cooperation with U.S. Army utilizing the Rotor Systems Research Aircraft (RSRA) and other testbed aircraft as appropriate. The flight data base will be expanded on existing rotors that can be readily adapted for evaluation on RSRA (and other rotorcraft) and advanced research rotor systems will be developed for evaluation. The development of the RSRA facilities will be completed and operation will be supported

W83-70096 Ames Research Center, Moffett Field, Calif

ROTORCRAFT SYSTEMS INTEGRATION

John Zuk 415-965-6568

(532-03-11, 505-42-11)

Research conducted under this RTOP will advance rotorcraft aeromechanics systems technology with an emphasis on improving basic design theory, rotor and rotor/airframe aerodynamics, and aeroelastic characteristics and methodology, vibration prediction and control noise prediction and control, advanced control system concepts, concepts, station crew and vehicle concepts. The research involves focused and coordinated programs requiring analysis, wind tunnel model testing, simulation and flight testing These programs encompass civil and military aspects of advanced rotorcraft concepts which will increase performance, efficiency, and productivity, reduce noise and vibration, and improve reliability

W83-70097

Lewis Research Center, Cleveland, Ohio CONVERTIBLE ENGINE SYSTEM TECHNOLOGY

K L Abdalla 216-433-6604

(505-42-32)

Part of the NASA Rotorcraft Program is aimed at advancing technology in engine components, transmissions, and propulsion system integration Objectives are to improve propulsion system durability, reliability, and cruise fuel consumption, to reduce life cycle cost, to develop propulsion technology unique to high productivity vehicles, and to increase operational capability and flexibility. The objective of this program is to provide a research tool for the Government to determine the feasibility of and advance the technology for a convertible engine concept for high speed rotorcraft. Technology readiness will be demonstrated in an experimental propulsion system incorporating advanced engine concepts. Through FY-82, this RTOP was entitled Advanced Rotorcraft Propulsion Technology and included work in basic research and technology in support of rotorcraft vehicles as well as the convertible engine system technology program Beginning with FY-83, the scope of this RTOP has been changed to cover only the convertible engine work. The basic rotorcraft R and T work is being covered by the related RTOP

W83-70098

532-03-11

532-06-11

532-06-13

532-06-12

Langley Research Center, Hampton, Va ROTORCRAFT VIBRATION AND NOISE Robert C Goetz 804-827-2042

(505-42-23)

The objectives of this research are to develop the technology for reducing the interior noise of helicopters through transmission/mainframe isolation, to develop the technology for improving rotor noise methodology and a noise criteria capability through the acquisition of acoustic data and development of noise prediction mehtods, and to verify analysis models for use in prediction of airframe vibrations. Contract studies will be performed on rotorcraft interior noise with emphasis on quantifying the noise radiated by the transmission and attenuating this noise by means of isolator systems. In the noise prediction area, model and full scale performance and acoustic data will be acquired for the purpose of developing and validating noise prediction methods, and to validate wind tunnel technology for use in determining the performance and noise characteristics of new design rotorcraft. A noise prediction system will be designed for rotorcraft use and available data bases will be installed within the system. Contracted efforts by the major rotorcraft manufacturing companies will include noise source identification, empirical noise prediction development data base acquisition in laboratories, wind tunnels, and flight and development of noise system components Continued study of finite element modeling will include correlation with ground vibration and flight test with prediction. In addition, a rotor analysis model suitable for use in airframe design analysis will be initiated

W83-70099

532-07-11

Ames Research Center, Moffett Field, Calif FLIGHT EXPERIMENTS SUPPORT F J Drinkwater 415-965-5687 (532-01-11, 532-03-11 533-02-50)

The objective of this effort is to provide overall operations support for Ames research aircraft flight experiments in low speed aerodynamics, flight dynamics and control, guidance and navigation, and avionics systems. This support activity consists of aircraft operations and maintenance required to carry out the flight tests, and the operation of ground based facilities which provide data acquisition and processing, aircraft tracking, landing guidance, communications, noise and meteorological measurements, and aircraft instrumentation.

W83-70100

532-08-11

Ames Research Center, Moffett Field, Calif SIMULATION FACILITIES OPERATIONS Anthony M Cook 415-965-5162

This RTOP covers support and operations of the flight simulation facilities at Ames Research Center These facilities consist of the Flight Simulator for Advanced Aircraft, the Vertical Motion Simulator, the Interchangeable Cab Fixed-Base Station, and a Flight and Guidance Laboratory The objective of this RTOP is to provide flight simulation support in research and technology programs for NASA, DOD, FAA, industry and other government agencies in the areas of handling qualities, flight dynamics, control systems, guidance and navigation, cockpit displays, and simulation technology. Flight simulation experiments will be related to various types of aircraft and rotorcraft, as well as Space Shuttle vehicles.

High-Speed Aircraft Systems Technology

W83-70101 533-02-11

Ames Research Center, Moffett Field, Calif
ADVANCED FIGHTER TECHNOLOGY INTEGRATION/F-111
(AFTI-F-111)

L J Caw 805-258-3311

The objective of this program is to conduct a series of experiments to verify in flight the predicted performance gains for the AFTT/F-111 mission adaptive wing. The flight experiments will verify the performance of active controls for load alleviation and reduced static stability incorporated in the AFTI/F-111 mission adaptive wing (MAW) aircraft Dryden Flight Research Facility will operate the F-111 aircraft and conduct an investigation of the MAW as a part of the joint NASA-Air Force AFTI/F-111 program. Dryden will participate in design reviews, develop and operate instrumentation and define flight test plans.

533-02-21

W83-70102 Ames Research Center, Moffett Field, Calif ADVANCED FIGHTER AIRCRAFT (F-15)

E M Kock 805-258-3311

The objective is to provide flight test support for high speed aircraft experiments. This will be accomplished by maintaining a baseline capability, with a high performance aircraft, that can be easily used to accommodate specific flight projects or experiments. The baseline support will include contractor maintenance support, instrumentation system operation, basic maintenance, and fuel. The experiments planned for FY-83 include operability evaluation of the F-100 engine with the digital electronic engine control, an operability evaluation of the F-100 engine model derivative, and an evaluation of the DEEC failure mode accommodation logic.

W83-70103 533-02-31

Ames Research Center, Moffett Field Calif
F-4C SPANWISE BLOWING FLIGHT INVESTIGATIONS

R G Bryant 805-258-3311

The overall objective is to verify, through full scale flight tests with a modified F-4C airplane, the low speed and transonic performance and the flying qualities improvements predicted by analytical and wind tunnel studies for spanwise blowing This program is a cooperative effort between Ames and Langley Research Centers Factors not readily assessable in the wind tunnel will also be evaluated during the flight tests. These include the use of spanwise blowing for improved maneuverability, control of low speed wing rock, alleviation of shock induced separation effects, and improved landing performance. Reynolds number and scale effects will be investigated.

W83-70104 533-02-33 Langley Research Center, Hampton, Va

F-4 SPANWISE BLOWING
P J Bobbitt 804-827-2961

The objective of this research is to verify, through full-scale flight tests, the takeoff and landing and subsonic maneuver performance and flying qualities improvements predicted by analytical and wind tunnel studies for the spanwise blowing (SWB) concept. The research will also provide information to define the effects of vehicle configuration and flight regime on the optimum nozzle location, size, geometry, and blowing rate. The approach involves wind tunnel tests of an F-4 model in the NASA LaRC 7- by 10 foot high speed tunnel to obtain the necessary data to aid in definition of the flight experiments at DFRC. The wind tunnel tests will evaluate an outboard location for the SWB nozzles in addition to the inboard location currently on the airplane. Other leading edge devices will also be tested in the tunnel to assess their effectiveness in controlling the leading edge vortex flow.

W83-70105 533-02-41

Ames Research Center, Moffett Field, Calif
INTEGRATED RESEARCH AIRCRAFT CONTROL TECHNOLOGY
(INTERACT)

B M Kock 805-258-3311

The objective is to develop, evaluate, and demonstrate an integrated airframe and propulsion control system. This will be accomplished through a flight research program using a suitably modified test airplane. In the near term, supporting research activities will be conducted to provide the technology data base leading to the flight program.

W83-70106 533-02-50

Ames Research Center, Moffett Field, Calif PROPULSIVE-LIFT TECHNOLOGY - QSRA FLIGHT EXPERIMENTS

J A Cochrane 415-965-5662

Advanced propulsive lift technology has been shown to provide significant improvements to civil and military aircraft operating in CTOL, RTOL, and STOL modes and is of current interest to the military services and the aircraft industry. Exploitation of these benefits requires research into parameters affecting performance, flight control systems, stability augmentation, cockpit displays, and operating procedures. In addition, operation of aircraft incorporating this technology in either a civil or a military environment requires the development of military specifications, civil certification criteria, and design data for use by procuring agencies regulatory agencies, and the aerospace industry. The quiet short haul research aircraft (QSRA) flight experiments program addresses these problems with a multidiscipline flight program using the QSRA equipped with a highly capable digital computer, advanced electronics displays and a programmable head-up display. The flight program is supported by a comprehensive simulation and analysis program. The program will investigate aerodynamic performance including the application of propulsive lift techniques to CTOL type aircraft to either reduce field length or increase payload at equal field length Flying qualities criteria for highly augmented control modes will be defined and head-up and color display concepts will be investigated for shipboard operations and tactical military missions. Operating margin criteria will be defined for highly augmented controls for the approach and landing Contributions to the landing field length will be determined for tactical military and civil operations. Real time energy management techniques will be applied for configuration management and flight profile generation for military and civil operations. Maneuvering enhancement through the application of propulsive lift will be investigated for civil noise abatement, fuel conservation, and military applications

W83-70107 533-02-51
Ames Research Center, Moffett Field, Calif
POWERED LIFT SYSTEMS TECHNOLOGY - HARRIER FLIGHT
RESEARCH PROGRAM

Bedford A Lampkin 415-965-6039

The Navy and Marine Corps are scheduled to deliver the Yav-8B Harrier Aircraft to Ames Research Center at the end of FY-83. A flight research program will be conducted with the aircraft at Ames Research Center and at Dryden Flight Research Facility Objectives of the flight research program are (1) to correlate flight measured aerodynamic/propulsion interactions with wind tunnel predictions and simulation model. (2) to provide a data base for control/display concepts for STOVL operations and combat maneuvering, and (3) to establish flying qualities criteria for flight control and display systems. A current contract to obtained the conceptual design of research modifications to the aircraft will be concluded in September 1982. Presently, ground support equipment unique to the aircraft is being procured. In FY-83, training of flight and maintenance personnel will be conducted, aircraft support contracts will be initiated, and research equipment will be procured as necessary. The first phase of flight research will start early in FY-84.

W83-70108 533-02-61 Ames Research Center, Moffett Field, Calif

C R Jarvis 805-258-3311

The overall objective of the Advanced Fighter Technology Integration (AFTI)/F-16 program is to quantify the benefits and penalties of the individual and integrated technologies proposed to improve weapon system effectiveness and survivability by flight demonstration of air to air and air to surface offensive and defensive mission roles. The digital flight control system, automatic maneuvering attack system, and pilot vehicle interface technologies are being implemented in a modified F-16 to allow flight evaluation of such nonclassical control modes as direct lift and side force, flat turn, fuselage pointing, and uncoupled independent control of aircraft rotation and translation. The AFTI/F-16 airplane will be flight tested and evaluated by a joint Dryden, USAF, and contractor flight test team and will be operated and maintained by Dryden from Dryden facilities.

W83-70109
Ames Research Center, Moffett Field, Calif
DECOUPLER PYLON FLIGHT EVALUATION
M R Barber 805-258-3311
(533-02-23)

In order to obtain maximum utilization of fighter aircraft, many different types and combinations of stores are pylon-mounted to the wings. The carriage of these stores can result in reduced flutter speeds or flutter placards with a corresponding degradation in mission effectiveness. The NASA Langley Research Center (LaRC) has developed a pylon, the decoupler pylon, which suppresses wing/store flutter. The decoupler pylon dynamically isolates the wing from the store pitch inertial effects by means of soft-spring and damper elements. Static pitch orientation of the store is maintained by a low frequency control system.

533-02-71

The decoupler pylon has been shown to be effective in suppressing wing/store flutter by analysis and wind tunnel tests on a rectangular research wing and in transonic wind tunnel test on the F-16 and YF-17 flutter models. These results have been very encouraging and NASA has defined a program to flight test the decoupler pylon A feasibility study and conceptual design have been conducted under contract establishing that the decoupler pylon concept can be implemented in flight hardware for testing on the F-16 aircraft General Dynamics Inc is fabricating a decoupler pylon for an F-16 aircraft under contract to LaRC Flight test of the decoupler pylon will be conducted under this RTOP

W83-70110 Langley Research Center, Hampton, Va 533-02-73

DECOUPLER PYLON FLIGHT DEMONSTRATION

R C Goetz 804-827-2042

(505-33-43)

A joint program between Langley Research Center and Dryden Flight Research Facility has the objective to demonstrate the suppression of wing/store flutter using the decoupler pylon concept on an advanced high performance airplane. The concept has been verified in wind tunnel studies. The purpose of the flight studies is to subject the concept to the effects of the full flight environment including maneuvering and atmospheric crusts while assessing the alleviation of the store flutter problem and to evaluate the dynamic characteristics of the wing-storedecoupler pylon system. The decoupler pylon is being designed and fabricated under contract to General Dynamics, Ft Worth, Texas, and will be flight tested at the Drygen Flight Research Facility. The Langley Research Center will exercise overall management control of the program

W83-70111

533-02-81

Ames Research Center, Moffett Field Calif SUPPORT FOR FORWARD SWEPT WING (X-29A)

Terrill W Putnam 805-258-3311

The objective is to provide technical advisory support, conduct analysis, wind tunnel tests, simulations, ground facility tests, and flight tests in order to discharge responsibilities established in the NASA/ DARPA Memorandum of Agreement concerning the Forward Swept Wing Program Dryden will provide technical support through participation in design reviews, independent analysis, ground tests, flight certification and readiness reviews, and through the implementation of a high fidelity real-time piloted simulation at Dryden Dryden will also provide approval of quality assurance plans and will provide proven flight test instrumentation from the Dryden inventory Ames will provide a high fidelity moving base simulation of the X-29A to study approach and landing characteris-

W83-70112

533-02-83

Langley Research Center, Hampton, Va FORWARD SWEPT WING SUPPORT

J Bobbitt 804-827-2961

The objective of this research is to conduct analyses, wind tunnel tests, simulations, ground facilities tests, and flight tests on the forward swept wing as necessary to explore and evaluate advanced technologies The research will provide high Reynolds number wind tunnel data for correlation with flight data and will support prediction of stall/spin characteristics The approach involves design and fabrication of a X-29A aircraft model for testing in the National Transonic Facility The stall/spin research will include static and dynamic-force tests, dynamic model flight tests, and piloted simulation studies

W83-70113

533-02-91

Ames Research Center, Moffett Field, Calif

FLIGHT SUPPORT

B D Axley 805-258-3311

Equipment, maintenance, and operation are provided for (1) support aircraft including (2) F-104N, F-104G, T-38, T-37, C-47, and Bell Helicopter, (2) service aircraft including B-52, PA-30, and JetStar Major effort and coordination of activities is provided by inhouse resources with augmentation by supporting contractors (engine maintenance, AGE maintenance, inventory management), fuel, parts, special support purchased from the military. This effort supports research flight programs. providing adequate proficiency of pilots, chase aircraft, R/D support in terms of research investigations and general operational support

W83-70114

533-03-11

Ames Research Center, Moffett Field, Calif. HIGHLY MANEUVERABLE AIRCRAFT TECHNOLOGY FLIGHT RESEARCH

H H Arnaiz 805-258-3311

This RTOP covers the flight test phase of a program to provide improved technology for the design of new advanced aircraft, with special emphasis on high maneuverability. Normal design practices have been relaxed to permit complete freedom in the application of state-of-the-art technologies such as fly-by-wire digital flight controls, composite structures, digital propulsion controls, improved aerodynamics and the like, in order to obtain maximum benefits from the combined interdisciplinary effects. The complex, high-risk technology design of the HiMAT will be validated by demonstrating in flight the transonic maneuverability goal of the vehicle (8g at 9 Mach, 25,000 ft alt) and the supersonic endurance goal (3 minutes at 1 4 Mach, 40,000 ft alt) The high level of technical risks inherent in the HiMAT design precludes their application to manned aircraft due to pilot safety concerns and vehicle costs. Free-flying powered. 44-scale models controlled by remote piloting techniques will be used to acquire flight test data at minimum costs

533-04-12

Lewis Research Center, Cleveland, Ohio

TURBINE ENGINE HOT SECTION TECHNOLOGY (HOST)

Daniel J Gauntner 216-433-5266

The turbine engine hot section technology (HOST) program will develop the analytical tools needed for improving the prediction of the durability of combustor liners and turbine vanes and blades of advanced aircraft turbines HOST will consist of contracted and in-house research efforts of both an analytical and an experimental nature in several technical areas The analytical aspects will include computerized models and predictive tools to describe the service environments and complex loading conditions of these engine components. The experimental aspects will provide new input data to the analytical models and will enable demonstration of the validity of the models and their superiority over present methods

Subsonic Aircraft Systems Technology

W83-70116

534-03-13

Langley Research Center, Hampton, Va STRUCTURAL INTEGRATION

H T Wright 804-827-3265

(505-33-33)

The primary objective is to develop technology for and accelerate the introduction of composite material in U.S. aircraft with focus on wing and fuselage components of military and commercial transports Key technology issues facing the application of composites to wing structure including critical joints, fuel containment, and durability/damage tolerance, will be addressed upon authorization of phase 2 of existing contracts to the major commercial manufacturers. The phase 2 program will be augmented with the requirement for evaluation of new toughened resin systems using the standard test procedures (NASA RP 1092) developed during phase 1. Studies (overguideline) will be initiated with commercial and military transport manufacturers to identify critical, long lead technologies which are considered vital to the efficient application of composites to fuselage structure

W83-70117

National Aeronautics and Space Administration, Washington, D.C. RADIO TECHNICAL COMMISSION FOR AERONAUTICS (RTCA) Lee D Goolsby 202-755-3003

This RTOP provides for the continuation of support to the Radio Technical Commission for Aeronautics (RTCA) located in Washington, DC The RTCA brings together experts from government, universities, and industrial establishments to advance the art and science of aeronautics through the investigation of present and potential applications of avionics and telecommunications. The RTCA and its special committees seek solutions to problems involving the application of electronics, avionics, and telecommunications to aeronautical operations, they frequently recommend technical performance standards and common operational requirements for consideration by Government, industry, and aviation users. As a member of the executive committee, NASA's representative can present subjects or problems for discussion and action, authorize new special committees, and approve completed studies. Through the mechanism of RTCA, NASA can be kept abreast of aeronautical needs and requirements and can initiate relevant research and participate in development of solutions to common problems with other members of the aviation community

W83-70118

534-04-13

Langley Research Center, Hampton, Va ADVANCED TRANSPORT OPERATING SYSTEMS

Burgess Malcolm 804-827-2925

The objectives are to define functional requirements and performance criteria for flight systems and displays of the future with which the pilot can safety and effectively operate in the evolving National Airspace System, to perform more efficient flight with respect to fuel, airspace, and time, to increase traffic flow capacity, and to improve the operational capability in adverse weather. The approach will be to investigate concepts to improve exchange of information between air traffic control (ATC) and aircraft throughout the flight profile, identify and promote incorporation of aircraft capabilities in design of ATC improvements to facilitate efficient operations, propose and investigate concepts offering improvements to flight deck design, ATC and aircraft systems, and procedures providing more efficient operations, propose and investigate strategies for optimization of terminal-area air traffic flow, and develop improved takeoff, approach, and landing capabilities Research activity involves analysis, mission simulations, and flight studies using facilities at Langley, Wallops, FAA Technical Center, and FAA-designated controlled airspace Simulation facilities and a modified B-737 airplane, equipped with highly flexible display and control systems, are used to study operating systems, and procedures in simulated future terminal area environments. The program includes active participation by major airframe manufacturers and cooperation with the FAA and airline representatives

W83-70119

535-01-12

Goddard Space Flight Center, Greenbelt, Md

RESEARCH AIRPORT OPERATION

Donald L Feller 804-824-3411

This RTOP covers the Fiscal Year 1983 Program Support costs associated with OAST programs that use the facilities of the Wallops research airport and other supporting services. Included are program aircraft ground servicing, control tower management of the Wallops airport control area, shop support, ADP operations, SAR, chase, and other aircraft flight services, crash, fire, and rescue services, specialized instrumentation and miscellaneous equipment

Advanced Propulsion Systems Technology

W83-70120

Lewis Research Center, Cleveland, Ohio **ENERGY EFFICIENT ENGINE PROJECT**

C C Ciepluch 216-433-6644

The objective of the Energy Efficient Engine project is to develop and demonstrate technology for a next generation turbofan engine having 10 to 15% lower specific fuel consumption, at least a 50% reduction in rate of performance deterioration, at least 5% reduction in direct operating cost, and reduced emissions and noise levels as compared to current high bypass turbofan aircraft engines. Initial program efforts included preliminary engine design and integration studies through contracts with two major aircraft engine manufacturers. On the basis of these studies and associated airframe and airline evaluations, engine cycles and configurations that best meet project goals were identified The major part of the project was then initiated with award of parallel component development and integration contracts to the same two engine companies. These latter contracts emphasize the advancements in component and systems technologies required for possible future commercial development of more energy efficient engines. Advanced engine components are being designed and developed, and performance is being verified by rig tests. The high spool core system is being designed, fabricated, and will be tested to evaluate its performance characteristics and to further refine the design of the components The low spool assembly integrated with the core will be used to evaluate two spool integrated performance and mechanical systems performance

W83-70121 535-03-11

Ames Research Center, Moffett Field, Calif

ADVANCED TURBOPROP-INSTALLATION AERODYNAMICS L Presley 415-965-5851

The objective of this research is to develop the technology required to_demonstrate the feasibility of advanced turboprop transport aircraft capable of cruise speeds up to 0.8 Mach number and altitudes above 35,000 feet. System studies will analyze specific aircraft design tradeoffs These studies will help determine the aircraft installation trades regarding cruise speed, engine location, propeller characteristics, etc., and thereby identify promising directions for future research. A combination of theoretical and experimental studies will be conducted to define the aerodynamic technology required to intergrate advanced turboprop propulsion systems with transport aircraft using supercritical wing technology Detailed flow interactions among the propeller slipstream, nacelle, and wing surface will be examined and methods to optimize the installation identified. Theoretical analyses use existing linar methods and include the development of advanced methods capable of handling the transonic slipstream-nacelle-wing interactions. Experimentally, the flow interactions are investigated using powered semispan models to provide an accurate simulation of the actual flow conditions. In addition, several two foot diameter scale models of advanced high-tipspeed propellers are tested on a JetStar aircraft capable of flying Mach 0.8 at 35,000 feet altitude. Microphones placed on the wing and fuselage are used to obtain near field noise data for acoustic research. Data from these flight tests will be analyzed and correlated with prediction

W83-70122

535-03-12

Lewis Research Center, Cleveland, Ohio

ADVANCED TURBOPROP PROGRAM

G K Sievers 216-433-4000

(505-40-32)

The objective of the Advanced Turboprop Program is to develop propeller and related drive system and aircraft technologies critical to efficient, reliable, and acceptable operation of advanced turboprop (prop-fan) powered aircraft. The present phase 2 effort (large scale structures) described by this RTOP, was initiated in FY-81 and is scheduled to be funded thru FY-85. The primary emphasis under this phase is the design, fabrication, and ground test of an advanced large scale propeller of 8 to 10 feet in diameter powered by an available gas turbine engine with a modified existing gearbox. Supporting analysis and testing work is planned in the areas of propeller aerodynamics, acoustics, structures, dynamics, and in aircraft cabin environment (noise and vibration) and aircraft installation aerodynamics. Studies of advanced turboprop propulsion systems and components, and of advanced turboprop aircraft, missions and applications, are also planned Although NASA Lewis hs overall management responsibility for the Advanced Turboprop Program, other field centers will manage and conduct portions of the program that lie within their areas of capability and expertise. The major efforts planned by other centers are the measurement installed aerodynamic performance (ARC), the inflight measurement of near field propeller noise (DFRC), and investigation of fuselage designs for low cabin noise with minimum weight penalty (LaRC). It is intended that the present phase 2 program lead to the final phase 3 effort (systems integration) where the propeller and propeller drive system generated by the phase 2 effort will be tested in flight using a specially modified test bed aircraft

Space Research and Technology Base Fluid and Thermal Physics Research and Technology

W83-70123

506-51-11

Ames Research Center, Moffett Field Calif

COMPUTATIONAL AND EXPERIMENTAL AEROTHERMODYNAM-

V L Peterson 415-965-5265

(506-51-41, 505-31-01, 506-54-11, 506-53-31, 506-63-35, 506-63-

The objective is to establish aerothermodynamic technology and configuration design concepts to improve vehicle safety, reliability, versatility, and aerodynamic efficiency with maximum payload for Earth-orbital missions and planetary exploration. Advanced computational methods and computer codes will be developed for predicting vehicle flow fields and performance. Turbulence models (used in these computer codes) will be developed from 'building block' numerical and physical experiments Aerothermodynamic studies will be performed of aeroassisted orbital transfer vehicles and advanced maneuvering vehicle concepts Data analysis for space shuttle experiments (OEX) will be performed including infrared image of the shuttle (IRIS), title gap heating and catalytic surface effects. New instrumentation techniques will be developed for the measurement of turbulence quantities in 3-dimensional flow fields. The use of the Shuttle Entry Air Data System (SEADS) will be investigated at subsonic and transonic speeds by the Dryden Flight Research Facility Aerodynamic data for reentry flight conditions will be obtained and used to extend the available data base to space shuttle reentry conditions

W83-70124

506-51-13

Langley Research Center, Hampton, Va ENTRY VEHICLE AEROTHERMODYNAMICS

G D Walberg 804-827-3887

The objective of this effort is to improve the fundamental understanding of aerodynamic and aerothermodynamic flow phenomena on entry vehicles in the continuum, transitional, and rarefied flow regime. Results of this research will permit significant advances in future space transportation vehicle capabilities, reliability, versatility, and efficiency The intent is to conduct fundamental and applied research using ground-based and flight experiments and analytical techniques to expand the data base and associated technologies beyond that established for the space shuttle Specific studies will be directed toward the solution of aerothermodynamic problems associated with future Earth-to-orbit and orbit transfer vehicles (OTV) including aerodynamic performance, viscous-interaction and real-gas effects, vortex interaction, heat transfer, basic configuration shaping, and optimization Emphasis will be given to the development of computational techniques for the prediction of aerodynamic performance of OTV's in the rarefied flow regime. These techniques will have useful application to studies of contamination due to propulsion exhaust products and to prediction of space station drag

506-51-23

W83-70125 Langley Research Center, Hampton Va DETAILED AEROTHERMAL LOADS

R C Goetz 804-827-2042

The primary objective of this effort is to identify and understand flow phenomena and flow/surface interaction parameters required to define detailed aerothermal loads for structural design. The secondary objective of this effort is to develop and validate analysis and test methods for the prediction and verification of structural response in thermal environments for use in the support of design, optimization, and qualification of space transportation systems. Effects of wavy surfaces, coves, gaps, protuberances, wing/body and wing/elevon junctions will be studied in wind tunnel tests. Selected problems will be studied analytically. Some effort will also be focused on mass addition cooling effects on flow phenomena with initial emphasis on conical shapes

506-51-41

Ames Research Center, Moffett Field, Calif THERMO-GASDYNAMIC TEST COMPLEX F H Nichols, Jr 415-965-6075 (505-31-01, 506-51-11, 506-53-31, 506-63-36)

This RTOP covers support and operation of the high energy facilities at Ames which include the Arc-Jet Complex (Aerodynamic Heating Tunnel, 2x9 Turbulent Flow Duct, 20-MW Panel Test Facility, 60-MW Interaction Heating Facility, Transitional Flow Facility, High Enthalpy Entry Facility, Giant Planet Facility, High Power Gas-Dynamic Laser).

3 5-Ft Hypersonic Wind Tunnel, High Reynolds Number Channels I and II Ballistic Range Facilities, and the Electric Arc Shock Tube Facility The objective of this effort is to provide aerodynamic and thermal testing in support of research and technology programs for NASA, Department of Defense, other government agencies, and industry Program areas supported include generic research applicable to spacecraft thermal protection systems, planetary entry aerothermodynamics, fluid dynamics (including boundary layers) and experimental verification of various computational codes Development, enhancement, and verification tests of the space shuttle thermal protection system is extensively supported, and the thermal protection system for the Galileo and OEX materials evaluations are also extensively supported Experimental verification of 2D and 3D fluid dynamics computer codes and turbulence modeling codes is a major testing effort. In addition, tests are performed for systems technology programs including advanced thermal protection systems, nuclear power pack safety, laser hardening of missiles, and the MX missile system

Materials and Structures Research and **Technology**

W83-70127 506-53-11

Ames Research Center, Moffett Field, Calif SURFACE PHYSICS AND COMPUTATIONAL CHEMISTRY J O Arnold 415-965-6209

The objective is to develop understanding of the mechanisms which control important properties of matter over a wide range of environments This understanding is leading to the development of new materials and processes needed by the agency Work is proceeding in the areas of surface physics and computational chemistry. In surface physics, properties of metallic interfaces are being determined by probing their structure at the atomistic level. High lateral and depth resolution chemical analysis by Auger electron spectroscopy is used to measure the compositional structure of high temperature metallic corrosion scales. Knowledge of surface/environment interactions is being improved by studying chemisorption and surface reactions on microscopic (single crystal) and macroscopic (cluster) metal surfaces. Work is underway on the interaction of electron beams with gaseous adsorbates on well-defined metal surfaces In computational chemistry, the physical and chemical properties of molecules and small atomic clusters (5-14 atoms) are being calculated using state-of-the-art wave function computer codes. These quantum mechanical results for the small atomic clusters are extrapolated by classical mechanics to determine surface and bulk properties of materials Improvements in precision, code optimization, and approximate methods are allowing larger systems to be studied, thus requiring smaller extrapolations to obtain surface and bulk properties. This also helps to elucidate the manner in which properties of atomic clusters approach those of the bulk material. These calculations are currently being used to investigate (and/or) model crack initiation and propagation, chemisorption, diffusion, corrosion, catalysis and internal rotations of polymer chains

506-53-12

Lewis Research Center, Cleveland, Ohio NON-DESTRUCTIVE EVALUATION AND TRIBOLOGY C Lowell 216-433-6922 (506-33-12, 506-33-32)

The objectives of this RTOP are to develop greater understanding of materials with aerospace propulsion and power potential and to develop guidelines for improving their physical/mechanical properties and reliability. Fundamental studies are aimed at investigating mechanical and other factors that limit material reliability, performance, and useful life Fundamental studies are also aimed at identifying scientific concepts that might be applied to substantially improve aerospace materials. The research includes Part A - material properties/performance enhancement via innovative application of nondestructive evaluation concepts/models for characterization of microstructure and extrinsic properties, and Part B - understanding of the basics of friction, wear, adhesion, thin film liquid lubrication, and the chemistry and morphology of solid lubricants

Jet Propulsion Laboratory, Pasadena, Calif.

FUNDAMENTALS OF MECHANICAL BEHAVIOR OF COMPOSITE MATRICES

A Gupta 213-354-5783

The long term objective of this RTOP is to develop a fundamental understanding at the molecular level of the behavior of polymers with major emphasis on candidate composite matrix materials including both thermosetting and thermoplastic polymers. For thermosetting polymers, the FY-83 objectives are to complete the studies of the curing kinetics to characterize the network topology and molecular relaxation mechanisms as well as viscoelastic properties, leading to an understanding of structure-property relationship. For thermoplastics, the objectives in FY-83 are to determine the effect of physical aging processes on the molecular relaxation mechanism of polymethyl methacrylate (PMMA) and to identify a candidate polyimide for studies of molecular deformation mechanisms and mechanical properties of high performance thermoplastic matrix materials. For thermosets the approach will involve thermal and spectroscopic studies of the curing reactions, sol/gel analysis of the cured polymers, and stress-optical characterization of molecular and mechanical response as a function of temperature and frequency For thermoplastics, the approach involves characterization of the simultaneous response of stress-strain and birefringence of a model thermoplastic with a controlled aging history

506-53-17 W83-70130

Lyndon B Johnson Space Center, Houston, Tex REFINING OF NONTERRESTRIAL MATERIALS

J Williams 713-483-2781

These studies are designed to provide data on chemical and physical processes which might be used to extract metals, minerals, and glasses from lunar rocks and soils for ultimate use in constructing and supporting space projects. Laboratory experimentation will be used to study some processes by which potentially useful materials may be extracted from lunar rocks and soils. These studies will be confined to the laboratory scale at the bench-top and will concentrate on the determination of basic physical properties which define and quantify processes. Our specific efforts are focused on the separation of analogs of lunar soils into their constituent mineral phase using electrostatic and magnetic techniques

W83-70131 506-53-23

Langley Research Center Hampton, Va COMPOSITES FOR ADVANCED SPACE SYSTEMS R C Goetz 804-827-2042

(505-33-33 505-33-23)

The objective of this research is to define and develop composite materials that have the potential of improving the performance and reducing the costs of space structures and space transportation systems Current emphasis is being placed on establishing the performance

capability of composites materials in the radiation environment of space, continued development of high temperature polymer composites and thermal control coatings, and understanding the mechanical behavior of composites to improve their damage tolerance. Current and advanced resin matrix composites will be subjected to laboratory simulated space radiation (proton, electrons, UV, etc.) to establish overall composite material performance and to identify radiation damage mechanisms. These studies will serve as a guide to develop models to predict material performance in the space environment and to evolve more radiation resistant materials. A basic understanding of the cure mechanics of high temperature composites will be established to provide for optimum and reproducible fabrication of structural components. A generic methodology will be established for prediction of the fracture strength of composites along with concepts and analyses to achieve improved damage tolerance such as the use of buffer strips. A significant portion of this research is directly related to Large Space Antenna Technology Focus established at Langley

W83-70132 506-53-25

Jet Propulsion Laboratory, Pasadena, Calif **EFFECTS OF SPACE ENVIRONMENT ON COMPOSITES** A Gupta 213-354-5783

The long range objective is to utilize ultrafast pulse radiolysis to gain an understanding of primary degradation processes caused by charged particles and high energy ultraviolet radiation in composite materials, and to ultimately use this information (along with conventional high energy exposure material test data) to develop a reliable methodology for estimation of the long term effects of space environment on polymers and composites. The objectives for FY-83 are to complete development of the energy deactivation model for TGDDM/DDS-based epoxy, to initiate studies of the effects of high energy ultraviolet radiation on candidate materials and to continue electron and proton pulse studies on polyimides and other candidate systems. The effect of charged particles on the long-term stability of the fiber-matrix interface will also be investigated, starting in FY-83 Transient measurements utilizing fast optical and ESR detection assemblies, following pulse radiolysis or UV excitation, will be used to determine rates of fast processes such as dissociation of primary intermediates, generation and decay of excited states resulting from ion recombination or other secondary processes, and radical formation and dissappearance. These data, along with conventional steady state data, will be used to develop analytical models of degradation and a reliable prediction technology for 20-year lifetime applications

W83-70133 506-53-26 Goddard Space Flight Center, Greenbelt, Md

John H Henninger 301-344-5309

The objective of this RTOP is to develop advanced conductive thermal control coatings and coating techniques. The needed advancements have been established by consultation with industry, thermal design, experiment, and materials personnel. The proposed work is divided into three main categories Capabilities and facilities for development, evaluation, and qualification efforts are all currently active within the proposing Goddard Space Flight Center (GSFC) organization The final products of this program will be definitive procedures and data for the preparation of coatings for space flight use, permitting private industry to act as suppliers. The research will investigate the development of composite vacuum deposited coatings on relatively thin, 0.1 mil or less, polyamide films using several vapor deposition techniques. The final coating will be tailored to yield high solar reflectance and thermal emittance values to produce low alpha/epsilon ratios and with known sensitivity to contamination. New vacuum deposition procedures for enhancing the utilization of electrically conductive and transparent indium oxide coatings will be developed. The use of RF ion plating techniques and plasma tube ionization in conjunction with varying glow discharge rates will be evaluated Finally, existing GSFC formulations and applications relating to electrically conductive inorganic paints will be modified The approach taken will be to optimize pigment size, improve vehicle conductivity at low temperature, and improve pigment firing procedures

W83-70134 506-53-27

Lyndon B Johnson Space Center, Houston, Tex
HYPERVELOCITY IMPACT RESISTANCE OF COMPOSITE
MATERIALS

D J Kessler 713-483-2956

Composite materials are being used in spacecraft structures on an increasing scale. In orbit, these materials may be exposed to hypervelocity impacts with meteoroids and space debris at relative velocities of 20 km/sec and 10 km/sec respectively. Past research has defined the hypervelocity impact resistance of aluminum alloys, but little or nothing

is known about the properties of composite materials. A series of tests are planned to define the hypervelocity impact properties of a number of composite materials and some simple structures made of the composites. The results of these tests will be compared with prior results for aluminum alloys, and engineering design criteria will be developed for the use of composites in structures exposed to the meteoroid/debris environment First, a series of screening tests will be done, using a small light gas gun to impact small projectiles on thin sheets of material. Several materials will then be selected for more intensive tests, using a large light gas gun to impact projectiles up to 2cm diameter at 10 km/sec on thickness of material significant for spacecraft construction, as well as on some simple structures (as tanks) made of composite materials.

W83-70135 506-53-29
Marshall Space Flight Center, Huntsville Ala

SPACE DURABLE COMPOSITES AND THERMAL CONTROL SURFACES

R L Gause 205-453-1500 (506-53-23)

The objective of this RTOP is to provide advanced materials technology that will be necessary to assure successful development of future spacecraft, large-area space structures, and advanced space transportation systems. Major areas of investigation include extending environmental durability of materials to at least 10 years in both LEO and GEO, increasing durability and/or repairability of thermal control coatings, identifying significant damage mechanisms that degrade composite materials, and evaluating new and improved composite matrices and fibers for resistance to environmental damage mechanisms The approach will be to select candidate composites for exposure, analysis, and evaluation, develop an environmental test matrix for these composite materials from the materials requirements, and perform and appropriate test program to acquire the relevant data. Radiation damage mechanisms in polymetric matrix materials will be identified through exposure to simulated space environment conditions and radiations Preliminary development of the methodology for accelerated testing of both polymeric matrix and metal matrix composites in the simulated space environment will be initiated. Thermal control surfaces technology will be developed to provide longer lifetimes, increased performance, on-orbit servicing, and improved particulate and contamination resistance

W83-70136 506-53-31

Ames Research Center, Moffett Field, Calif
THERMAL PROTECTION SYSTEMS MATERIALS AND SYSTEMS
EVALUATION

H K Larson 415-965-5369

(506-51-11, 506-51-41, 506-63-36)

The objective is to provide thermal protection systems (TPS) concepts and materials for heat shields to protect earth and planetary entry vehicles and planetary probes during atmospheric entry. The specific objectives are to develop improved materials and minimum weight TPS to enhance the space shuttle and enable fully reusable advanced space transportation systems development develop planetary probe heat shield materials and determine methods to minimize heat shield weights, develop concepts and heat shield materials for safe earth entry of radioactive power sources, support DoD requirements, develop concepts and materials for orbital transfer vehicle, advanced military spacecraft and solar probe heat shields. The system requirements for each end use are defined Thermal protection material parameters are determined that meet these requirements. Materials are either selected from the extensive technology in existence or new materials with optimized properties are developed Candidate thermal protection concepts and materials are subjected to systematic analysis and testing to quality them for the defined end use Extensive unique Ames arc plasma test facilities developed for space shuttle and planetary entry probes are used in the experimental evaluations. Analytical studies are performed utilizing unique enviromental computer codes developed by ARC that include detailed models of both the aerothermal environment and material response to obtain in-depth understanding of the material characteristics. Materials are often developed as a result of these studies to meet the ever more stringent requirements for atmospheric entry thermal protection

W83-70137 506-53-33 Langley Research Center, Hampton, Va THERMAL PROTECTION SYSTEMS FOR EARTH-TO-ORBIT STS R C Goetz 804-827-2042 (506-53-43, 506-51-23)

The objectives of this research are to provide thermal protection systems (TPS) materials and concepts for advanced space transportation systems that provide improved durability and operational costs compared to the current LI-900 and LI-2200 reusable surface insulation systems Heat shield testing support to the current STS program will be provided

High strength advanced carbon-carbon (ACC) sheet material with an improved coating will be developed. Ti, superalloys, and ODS alloys will be exposed to simulated shuttle entry environments to determine dynamic oxidation resistance, emittance stability, and strength retention A major objective will be to develop an understanding of the stability and emittance of oxides that form on the surface of high temperature alloys in an oxygen deficient environment. Concepts research includes metallic pre-packaged and ACC post-supported standoff concepts These concepts will be evaluated in various Langley high temperature wind tunnels and will be subjected to other types of tests such as foreign object impact and radiant heating. Arc tunnel and other facilities will be used as required to validate and certify TPS for multimission

W83-70138

506-53-37

Lyndon B Johnson Space Center, Houston, Tex ADVANCED CARBON-CARBON PANELS

D M Curry 713-483-2375

This RTOP provides for the design, development, and evaluation of carbon-carbon panels for both general acreage and specific high temperature areas of the shuttle orbiter. The advanced carbon-carbon material developed by the Vought Corporation under a NASA Langley contract will be used as the baseline material. Under previous RTOP funding, an advanced carbon-carbon (ACC) stand-off panel has been designed and fabricated for the area between the orbiter nose cap and nose landing gear door using the ACC material. The results of these RTOP studies will evaluate the advanced carbon-carbon panels with respect to the baseline obiter reusable surface insulation (RSI) thermal protection system (TPS) in terms of weight, cost, performance, and maintainability, and form the basis for studies of the application of ACC TPS to orbital transfer vehicles and future launch/entry vehicles

W83-70139 506-53-40

National Aeronautics and Space Administration, Washington, D.C. ADVANCED SPACE STRUCTURAL CONCEPTS

Sam Venneri 201-755-3277

The objective of this RTOP is to provide a fundamental research program to obtain an understanding of the effective use of space vehicles and exploration of space. The program will concern itself with novel tructural forms, human productivity in space, and maintenance of the geometric tolerances of large space structures

W83-70140 506-53-43

Langley Research Center Hampton, Va **ADVANCED SPACE STRUCTURES**

R C Goetz 804-827-2042

Research will be performed on structures for future spacecraft including platforms, antennas, and space station and for future space transportation systems in-house, deployable and erectable structural concepts and associated design technology will be developed for large platforms and antennas Folding and packaging techniques for very low-mass deployable structures will be investigated Effects of using very slender members to achieve high packaging efficiency will be evaluated, and a slender-member truss structure will be constructed for static and dynamic tests. Studies of achievable accuracy will be conducted Under contract, development of the Maypole Hoop/Column Deployable Antenna will continue by designing, building, and testing a 15-meter kinematic model. Space station structural research will include assessment of state-of-the-art in analysis for structural dynamics and control of multi-body configurations. In-house and contract research on structures for future space transportation systems will include fabrication of test panels for cryogenic tankage and small component testing of advanced carbon-carbon structure

W83-70141 506-53-45

Jet Propulsion Laboratory Pasadena, Calif ADVANCED SPACE STRUCTURES ANTENNA TECHNOLOGY DEVELOPMENT

R E Freeland 213-354-3540

The long range objectives of this RTOP are to (1) develop the offset wrap-rib deployable antenna concept to the point of technology readiness for classes of potential applications, (2) develop the analytical capability of JPL for the prediction of antenna performances for purposes of understanding the basic concept, and determining the potential of the concept for different applications, (3) perform development testing of hardware for verification of the analytical tools and the identification of deficiencies in the analytical or experimental techniques, and (4) support the development of candidate system level configurations to help focus the conceptual development. The technical approach is based on the following tasks (1) establish the practical limits of performance for the wrap-rib deployable antenna concept. (2) formulate a technology development program that is responsive to the potential user community,

(3) support NASA and DOD sponsored system studies based on the offset wrap-rib antenna concept, (4) demonstrate antenna concept technology readiness using a 55-meter diameter proof of concept hardware model that will be ground tested to demonstrate antenna deployment, and validation of analytical performance prediction models, (5) develop preliminary design for a full scale antenna of 100-meters in diameter, based on the experience gained from the design, fabrication, assembly and testing of the proof of concept hardware along with analytical estimates of antenna performance based on validated models. (6) develop the analytical capability of quickly and cost effectively predict the on-orbit static and dynamic stability of the reflector surface and its alignment with respect to the feed support structure, (7) perform antenna component or model testing to determine the static, dynamic, and thermal characteristics for correlation with the analytical models, and (8) develop approaches and techniques for improving the reliability and accuracy of analytical performance predictions of large very flexible

W83-70142

506-53-51

Ames Research Center, Moffett Field, Calif STRUCTURES ANALYSIS AND SYNTHESIS

L Carter 805-258-3311

Experimental data from flight and laboratory tests of high temperature structures will be obtained and used to (1) develop strain gage load measurement techniques for high speed flight vehicles, (2) evaluate state-of-the-art analytical methods for high speed flight vehicles, and (3)demonstrate new structural concepts for high speed flight vehicles

W83-70143

506-53-53

Langley Research Center, Hampton, Va ANALYSIS AND DESIGN R C Goetz 804-827-2042

(505-33-53)

The technical objectives are (1) to develop advanced structural and thermal analysis methods for predicting the nonlinear behavior of aerospace structures under mechanical and thermal excitations, (2) to develop mathematical algorithms for multidisciplinary optimization methods for aerospace structures, (3) to develop and validate analysis and test methods for the prediction and verification of structural response in dynamic, acoustic, and thermal environments for use in the support of preliminary and advanced design, optimization, and qualification of space transportation systems and payloads, spacecraft, and platforms. (4) to accomplish validated capability to control excessive responses of large flexible space structures by active and passive methods, (5) to develop new analytic methods for predicting the coupled structural dynamics and control of multi-body space station configurations, and (6) to develop structural analysis methods for predicting the nonlinear behavior of aerospace structures. The work will be accomplished through in-house efforts with both contract and grant support

W83-70144

506-53-55

Jet Propulsion Laboratory, Pasadena, Calif SPACE VEHICLE DYNAMICS METHODOLOGY J A Garba 213-354-2085

The objectives of this effort are to identify, develop and demonstrate techniques for the improvement of low frequency dynamic payload response predictions, to advance methods for the correlation of analysis with test data and to identify the requirements for research for future missions. The methods will be verified using flight data wherever possible To meet these objectives new methods for predicting upper bound spacecraft member loads will be sought, existing methods for upgrading analytical models will be evaluated the criteria for analysis/test correlation will be evaluated, and test data for a real complex shuttle will be obtained using several different techniques. Other objectives are to develop new methods for the analysis and synthesis of large complex structural systems, advance the state-of-the-art in nonlinear and dynamic analysis of structures, develop methods for the identification of structual parameters. To meet these objectives the development of highly efficient techniques for structural optimization using the ACCESS-3 computer code will be continued. Several refinements to increase operational efficiency will be implemented and new capabilities, such as additional finite elements, will be added. In future years it is planned to exploit recent advances in computer technology to improve the operational efficiency of ACCESS-3 Prof LA Schmit of UCLA will serve as a consultant. The activities will be coordinated with personnel at LaRC who are engaged in complimentary tasks

506-54-12

506-54-13

W83-70145 Goddard Space Flight Center, Greenbelt, Md PAYLOADS DEFINITION METHODS J P Young 301-344-8284 (506-63-36)

The objectives are to develop the capability to simulate the structural and control system dynamics behavior of large multibodied space stations, develop advanced techniques for thermal analysis of space stations, produce improved techniques for deriving vibroacoustic, transient, and related combined environment criteria for STS payloads and develop the technology required to monitor in service structural integrity of large space systems (LSS) The DISCOS system dynamics analysis program will be enhanced to provide capabilities needed to support design of space stations. Enhancements will be in areas of absolute acceleration computation, modal representation of multiple/hinge connected bodies, and more efficient time domain solution. New capabilities will be developed to rapidly generate FORTRAN simulations of nonlinear controllers and generate reduced order equations Studies will be conducted to advance thermal analysis techniques in the areas of thermal mode analysis, radiation exchange factor computation, and translation from a thermal finite element model to a nodal model. The VAPEPS and PACES programs will be exercised and validated. The relative importance of vibroacoustic and liftoff low frequency transient induced loads on payload design will be evaluated. Formulate technology development guidelines for on orbit NDE, organize a workshop on LSS oriented NDE, and produce a LSS test model for use in a round robin development effort

506-53-56

W83-70146 506-53-59
Marshall Space Flight Center, Huntsville, Ala
SPACE VEHICLE STRUCTURAL DYNAMIC ANALYSIS AND
SYNTHESIS METHODS
R S Ryan 205-453-2481

The objective is to reduce the high costs and schedule delays due to structural dynamic response phenomena during the development of future spacecraft. Dynamics considerations have been critical for several recent NASA projects and are expected to be even more critical for future projects due to fundamental physical principles. Four tasks, both ongoing and new, are proposed for the development of improved prediction methods including. The development of improved structural and fluid dynamic analysis capability, establish acoustic environmental accuracy requirements for response determination, develop load combinations for design of STS payload components, and investigate the properties of classical modes, complex modes, modes with closely spaced frequencies, and identification of modes from tests Task 1 Improved Structural and Fluid Dynamic Analysis Capability -- continued development of analysis methods to improve capability and usability. The SPAR program is the basis of this work Task 2 Acoustic Environmental Accuracy Requirements fo Response Determination -- The present program SAIPEN will be extended to provide payload response PSD prediction capability The Statistical Energy Analysis method is used Task 3 Load Combinations for Design of STS Payload Components -- Present methods are over conservative and no industry-wide standard exists. Very significant payload improvements should be possible. Task 4. Modal Modeling and Testing -- An investigation into the properties of classical modes, complex modes, modes with closely spaced frequencies, and identification of modes from

Computer Science and Electronics Research and Technology

W83-70147

Ames Research Center, Moffett Field, Calif
PHOTOPHYSICS AND OPTICAL INFORMATION PROCESSING
R L McKenzie 415-965-6158
(506-51-11)

The general objectives are (1) to incorporate modern laser technology and photophysics in a program to develop nonintrusive techniques for the characterization of gaseous media in a dynamic state, are (2) to develop and evaluate optical computer processors and nonlinear fiber optics for advanced information processors to enable new space experiments, onboard processing, and higher information and data transfer for space applications using integrated optical techniques. Activities will include (1) the measurement of turbulent fluctuations in the state variables of cold transonic and supersonic wind tunnel flow, (2) the spectroscopy of small molecules important in the photodiagnostics of cold air flow and combustion processes, (3) the development of a programmable matrix mask for optical computing, (4) the development of optically nonlinear fibers for the infrared beyond microns, (5) the demonstration

of frequency doubling in the 5 micron region, and (6) the summing of 5 micron radiation into the visible for ultra-sensitive high-bandwidth detection of infrared photons. The change in scope in FY-83 is the work toward the development of the programmable matrix mask which is the key element in a usable optical computer.

W83-70148

Lewis Research Center, Cleveland, Ohio SUBMILLIMETER & OPTICAL PROCESSING DEVICE RESEARCH F Teren 212-433-4000

(506-54-42, 505-40-52, 505-34-02)

The overall objective is to conceive and demonstrate techniques for high-speed numerical calculation using electro-optic technology. Specific objectives include high-speed solution of matrix equations with a hybrid electro-optical processor, and laboratory demonstration of selected concepts for an all-digital optical processor. Work is conducted through University grants and in-house analysis and experiments. Laboratory experiments are conducted using commercially available hardware such as acousto-optic modulators and liquid crystal light valves. An in-house design study of fast-response spatial light modulators will be conducted. Another objective of this RTOP is to provide through research, design data and developments of materials and methods, the technology base for the development of voltage tunable local oscillator sources, capable of approximately 1 milli-watt output in the frequency range between 600 to 2000 GHz

W83-70149
Langley Research Center Hampton, Va
SOLID STATE & OPTICAL DEVICE RESEARCH

R L Stermer 804-827-3535 The objective is to explore and develop novel concepts in advanced solid state and optical devices to enhance data transfer, storage, and real-time data processing to meet electronic system requirements for projected aerospace systems. Emerging data systems concepts to meet the operations and control requirements of a large space station and other proposed aerospace systems are to be used as guidance in developing devices. Special emphasis will be on developing advanced electronic and optical devices which will enhance system performance, and expandability/adaptiveness in a cost effective manner. A balanced approached to obtain the advantages of in-house research, grants, and research contracts is to be used. Theoretical and experimental investigations of device concepts, materials, and processing techniques will be conducted in-house. Contractual efforts will be used to develop the device concepts and technologies to a level of practical demonstration This complementary effort of in-house and contractual research is to be supplemented with university research to provide the scientific base to predict device performance over a wide range of applications

W83-70150 506-54-15

Jet Propulsion Laboratory, Pasadena, Calif

ELECTRONICS RESEARCH AND TECHNOLOGY

H Pickett 213-354-6861
(506-54-25)

This RTOP has the objective of developing enabling technoloy for NASA thrusts and missions in the areas of lasers, solid state devices and optical processors. The following sub-tasks support this objective (1) submillimeter components development of quasi-optical technique, radiation coupling method, efficient non-linear devices and local oscillators and demonstration of the resultant receiver systems, (2) diffraction radiation generator demonstrate feasibility of the DRG as a coherent. tunable source of near and submillimeter radiation, (3) UV laser spectroscopy study reactions in laser plasmas for developing new laser sources for remote sensing of atmospheric gases, phytoplankton and mineral species using laser spectroscopy, (4) electron impact spectroscopy generate laboratory data for electron collision processes pertinent to laser and plasma devices, (5) electron impact emissions measure optical emission cross sections, oscillator strengths, dissociative attachment and ionization cross sections for atoms and molecules of interest, (6) fundamental electronics advanced techniques are developed to correlate chemical processing with degradation and basic reliability problems affecting the use of LSI & VLSI circuits. Devices using superlattice structures are explored using surface analytical techniques, (7) SAR processor develop compact, high throughput data processing devices and systems utilizing coherent optical elements, (8) parallel optical processor discover, evaluate, and develop concepts for optical processors that can be used to maniuplate large streams of data and provide solutions to control equations in real-time, and (9) optical processing materials and devices MBE strained layer superlattice structures fabricated by MBE in InGaAs will be investigated for integrated optics devices applications

W83-70151 506-54-16

Goddard Space Flight Center Greenbelt, Md

ACOUSTO-OPTIC & SUBMILLIMETER DEVICE TECHNOLOGY M Mumma 301-344-6994

(506-54-26 506-54-46 405-02-02, 188-41-55)

Acousto-optic techniques will be developed for use in tandem with heterodyne receivers as widebandwidth IF spectrometers Integrated optics acousto-optic spectrometer will be procured and studied and its suitability as an IF spectrometers will be evaluated Bulk Bragg cell AOS will be constructed and tested in a ruggedized form, as a first step in evaluating its usefulness as IF spectrometers. Compact, high resolution, submillimeter wave heterodyne spectrometers for astronomical and atmospheric science applications will be developed

506-54-17

Lyndon B Johnson Space Center Houston Tex PROGRAMMABLE MASK TECHNOLOGY

Harry Erwin 713-483-3669

Optical processing systems offer significant advantages for high speed parallel processing of data needed to support present and future NASA missions and thrusts. The inherent parallel nature of light makes high speed, small integrated, optical processors possible. The immediate objective of the proposed effort is to develop reliable liquid crystal light valve (LCLV) devices to achieve accurate and faster spatial modulation for the optical cross correlation processing data. At the present time, gallium arsenide and silicon have been used to demonstrate the feasibility of the LCLV devices. The effort under this RTOP will be directed to increase the reliability of these devices. Furthermore, the development of charge coupled devices (CCD) will also be undertaken. The CCD LCLV provides an efficient and flexible means of data storage for cross correlation processing. The feasibility of LCLV devices has been investigated by Hughes Aircraft Company under US Air Force sponsorship Available LCLV first-generation devices are presented being investigated for data correlation processing applications at JSC. This effort will be expanded in FY-84 to FY-86 to incorporate the newly developed LCLV devices for specific applications to the shuttle and space station data correlation processing

506-54-21

Ames Research Center, Moffett Field, Calif FAR INFRARED DETECTORS AND COOLERS RESEARCH C R McCreight 415-965-6549

The objective of this RTOP is to develop advanced infrared detection systems for astronomical research. This program will provide the technology for new and more efficient data acquisition capability throughout the infrared (IR) spectrum (2 to 200 microns) for the low-background astronomical application. It will benefit the entire NASA IR astronomy program including future programs such as the shuttle infrared telescope facility (SIRTF) and the large deployable reflector (LDR), and the on-going ground based airborne and balloon-borne programs The objectives of this RTOP are to develop a fundamental understanding of the behavior of cryogenic devices that are generic to the space applications of low noise high sensitivity receivers for communication and astronomical systems advance critical optics technology for future telescope systems and optical instrumentation, and, develop technology for the efficient storage of cryogens in space

W83-70154 506-54-23

Langley Research Center, Hampton Va

HIGH RESOLUTION LASER SENSING RESEARCH

J M Hoell 804-827-2818

(506-61-81 422-50-06)

(506-54-23)

The objective of this research is to investigate advanced laser and electro-optic sensor concepts, broadband passive microwave systems, develop systems technology and perform systems-level laboratory and field technology demonstration for remote and in situ sensing of atmosphere and marine properties. Specific sensor areas to be investigated are passive laser heterodyne system technology for remote measurement of the atmospheric species, active laser (LIDAR) sensing system technology for remote high vertical resolution measurements of atmospheric species wind velocities (e.g. shear turbulence and transport determination) and pushbroom microwave radiometer technology for measurement of geophysical parameters using large space antenna systems

W83-70155

506-54-25

Jet Propulsion Laboratory Pasadena, Calif ACTIVE AND PASSIVE SENSOR RESEARCH

N M Nerheim 213-354-2547

(506-54-15)

This RTOP provides research and development support for visible

and ultraviolet lasers for remote sensing applications. In the area of primarily visible lasers, the proposed work involves basic research to exploit a new discovery utilizing anti-Stokes Raman scattering to obtain tunable laser radiation, and improving the operating parameters of the copper halide laser for spaceborne altimetry applications. In the area orimarily ultraviolet lasers, the thrust is toward field measurements. The objectives of this program are to develop infrared detector arrays and to demonstrate IR array instrument systems applicable to future NASA remote sensing missions. The objectives also include detailed parametric characterization of infrared detector capabilities. The objective of this program is to develop evolutionary devices which will result in innovative camera systems Four areas of technology will be examined They are wide spectral band CCD sensors on-chip motion compensated CCD sensors ultra-low noise CCD sensors and on-chip spectral filters

W83-70156

506-54-26

Goddard Space Flight Center Greenbelt, Md SENSOR RESEARCH AND TECHNOLOGY

J Bufton 301-344-5626

(676-59-36, 692-20-10 147-10-11)

Mechanical cooler and solid cryogenic technology will be provided which will be applicable to the large number of future missions that will require instrument cryogenic cooling. The data base for the properties of instrument optical components at cryogenic temperatures will be expanded by developing the apparatus and making appropriate measurements to configure state-of-the-art hardware and software to provide an instrument system simulator with interactive and realtime capabilities for use by engineers and scientists in the design development, analysis and parametric study of instrument concepts. In addition advanced technology and system concepts will be developed for active and passive microwave sensing of the Earth and its environment. Lasers and laser-related components and instruments will also be developed in support of NASA programs in geophysics time transfer, and the atmospheric sciences. To continue our development of millimeter and submillimeter-wave coherent detectors (mixers) with sensitivity approaching the ultimate quantum noise limit. To demonstrate the feasibility of this approach a 115-GHz SIS receiver will be built for operation on the Columbia/GISS radio telescope SIS tunnel diodes will be provided to our specifications, by IBM Sperry, Princeton University, and the University of Virginia, under cooperative (no-cost) agreements. To produce an array of high quantum efficiency high energy resolution X-ray detectors capable of imaging X-ray sources at energies above 1 Kev by utilizing deep diode technology The approach utilizes the 'deep diode method wherein aluminum (Al) electrodes or posts are thermally driven through a silicon base wafer

W83-70157 506-54-27

Lyndon B Johnson Space Center Houston, Tex **MULTIFUNCTION SAR TECHNOLOGY**

K Krishen 713-483-5518

Synthetic aperture radar (SAR) systems provide day/night, nearly all weather high resolution data not available with sensors in the other parts of the electromagnetic spectrum. Recent NASA Active Microwave Remote Sensing Research Program Plan indentifies several unique Earth resources applications of SAR's The potential of SAR's for these applications can only be established in a limited manner with the presently available SAR capabilities which include single-frequency, singlepolarization and swatch-widths up to 100 Km. The objective of the Multifunction SAR Technology Program is to develop technology for the fabrication of multimission spacecraft SAR's capable of operating at selectable frequency(ies), polarization(s) bandwidth incidence angle(s), and wide swath with improved spatial resolution and calibration. The immediate goal is to conduct studies, design fabricate, and conduct performance tests for advanced antenna systems, calibration subsystems, advanced distributed array SAR, and wide-swath SAR's to allow fabrication of SAR systems with new functional and performance capabilities for missions planned for the 1985 to 1995 period Demonstration of the new technology will be accomplished through laboratory, aircraft, or spacecraft testing on a subsystem level for the most efficient use of the resources. Other technology areas which include pixel elevation mapping, frequency agile/diversity SAR, phase/polarization mapping, and bistatic SAR will also be identified and prioritized for future development

W83-70158

506-54-50

National Aeronautics and Space Administration Washington, D.C. AEROSPACE COMPUTER SCIENCE UNIVERSITY RESEARCH Ronald L Larsen 202-755-2364

(505-37-20)

The objectives are to develop university-based center for aerospace computing technology, focusing on concurrent processing, highly reliable computing, and scientific and engineering information management and foster cooperative, coordinated research coupling computer science with aeronautics, astronautics, and space sciences

W83-70159

506-54-56

Goddard Space Flight Center, Greenbelt, Md MPP - SYSTEMS SOFTWARE R & T Kenneth Wallgren 301-244-5184 (506-54-36)

The objective of the MPP Software RTOP is to develop systems level software critical to the Massively Parallel Processor (MPP) This software will provide tools, techniques, and languages to allow applications programmers to efficiently develop, test, and demonstrate discipline specific software on the MPP. The secondary objective is to provide operation and maintenance support for the MPP hardware system. The approach consists of developing and maintaining software modules at the systems level. These include critical MPP executive routines, compiler(s), libraries, and the MPP simulator

W83-70160

506-54-61

Ames Research Center, Moffett Field Calif

ADVANCED CONCEPTS FOR KNOWLEDGE-BASED EXPERT SYSTEMS

H Lum 415-965-6544

(506-54-31, 506-54-51, 506-31-01)

Development of basic computer science tools required for knowledgebased expert systems will provide the impetus for automated spacecraft, space platforms, scientific instruments and ground based stations. Use of these tools in automated expert systems will result in more scientific return per unit dollar and minimum labor-intensive tasks. This research effort will utilize the results developed for NASA at NBS (W. Gevarter). the computer science expertise available at Stanford University, and the experience resident at prominent companies utilizing artificial intelligence techniques such as Digital Equipment Corporation, SRI and Fairchild The research emphasis will be in the areas of image understanding and information extraction, heuristic programming, and natural language systems. Early feasibility demonstrations will be conducted as major significant milestones are accomplished, potential demonstrations will include applications in space flight mission operations centers, airborne and ground based infrared astronomical observatories, and technology transfer programs

W83-70161

506-54-63

Langley Research Center, Hampton, Va **AUTOMATION SYSTEMS RESEARCH** J Meintel, Jr 804-827-2489

(506-57-23 506-64-23)

The objective of this activity is to develop and support the technology base required to design, develop, and automate teleoperator and robotic systems to enhance man's capabilities for future space activities including servicing, maintenance and reparing, structural assembly and space manufacturing. To achieve these objectives, the program focus will be to conceptualize, investigate, and verify algorithms, sensors actuators, software and system architecture required for remote space operations. The research will be conducted through simulation and laboratory hardware experimental tests. Parametric studies and analysis will be conducted to identify subsystem and component requirements. Control research will include control modes, stability, time delays, trajectory optimization, and evaluation of various levels of direct, shared manual/computer, and supervisory control Basic research on the application of adaptive control techniques for the control of flexible or limber manipulators with distributed sensing and actuation will also be supported. The application of artificial intelligence techniques for autonomous task planning multiple system coordination, and monitoring and diagnosing the functioning of systems and subsystems will be evaluated

W83-70162

506-54-65

Jet Propulsion Laboratory, Pasadena, Calif

AUTOMATION TECHNOLOGY FOR PLANNING, TELEOPERATION AND ROBOTICS

S Grenander 213-354-2683

(506-57-25)

The general objectives are to develop the technology base required in automated planning and decision making in the space program and to provide automated manipulation, sensing and actuation technology for future NASA teleoperation and robotics applications, such as satellite servicing, space assembly, and space construction. The objectives of the uplink process control automation effort are to identify, develop and guide development and demonstrate techniques and technologies which have the potential of allowing the uplink process for mission operations to be designed and operated with significantly reduced cost, significantly increased responsiveness and with a higher degree of accuracy than is possible with currently applied techniques and technologies. The objective of the automated decision making/machine intelligence effort is to develop software tools that automate NASA mission operations functions which are now labor-intensive Functions being investigated are (1) automatic generation of computer code by planning methods and concomitant automated scheduling (applied to mission command sequence generation), (2) automated fault diagnosis of spacecraft (applied to monitoring of telemetered data) In addition, assistance in using these tools is provided to the workers engaged in the uplink and downlink process control tasks of mission operations The objective of the teleoperation and robotics task area is to provide technology in sensing, perception, and manipulation needed for future NASA missions utilizing teleoperators and robots. Included are tasks in (1) interactive automation for teleoperators (2) sensor based control languages, and (3) machine vision

W83-70163

506-54-66

Goddard Space Flight Center, Greenbelt, Md **AUTOMATION RESEARCH AND TECHNOLOGY FOR NEAR-EARTH** MISSION OPERATIONS

D Friedman 301-344-6242

The objectives are to help provide NASA with a full understanding of knowledge based systems technology and to provide via prototype applications, a demonstration of its potential in the area of command and control systems. Applications of knowledge based techniques in command and control systems will be prototyped to demonstrate proof-of-concepts. Another objective is to expand the application of automation in the space program. The intention is to provide NASA with the basic technology required for knowledge based systems. The approach of this RTOP is to perform basic research in machine intelligence (primarily at universities) and to perform evelopment on machine intelligence in a NASA context (primarily in-house). The final goal is to develop a technology which can provide automated on-ground or in-orbit assembly, disassembly, servicing, and repair of aerospace systems used in NASA missions. This technology uses a knowledge base which contains the information describing the automatic tooling motions and tests required for performing such tasks on a specific system. This data will be generated from the computer aided design process used to create the system. The data would include items needed to generate the appropriate actions for assembly or disassembly such as component location orientation, shape, and attachment method

W83-70164

506-54-67

Lyndon B Johnson Space Center Houston, Tex **AUTOMATIONS TECHNOLOGY FOR MANNED SPACE SYSTEMS** Max Engert 713-483-2872

The objective of this RTOP is to develop automation technology as applied to manned space transportation and space station systems. Focus of the activity will be on two major areas automatic fault detection and isolation and the automation of a labor intensive subsystem peculiar to manned systems. In the latter area the environment control and life support system has been selected. This system, when its present level of technology and complexity as extrapolated from existing manned transportation systems to those of the future and that required by the space station, will be entirely impractical unless it is automated. A key component of the approach is the development and application of expert systems to the areas covered by this RTOP

Space Energy Conversion Research and **Technology**

W83-70165

506-55-12

Lewis Research Center, Cleveland, Ohio ADVANCED CONCEPTS IN ENERGY CONVERSION

R W Bercaw 216-433-6992

The objective of this effort is to investigate advanced concepts in energy processing for space applications. The energy processing elements include the areas of (1) sources, (2) conversion techniques and devices, (3) storage, and (4) transmission or distribution systems and components Concepts to be investigated in this program are those considered to be high risk and innovative but, if successfully developed, could provide substantial performance improvements for space missions beyond the 1990's New energetics concepts will be actively pursued through in-house activities, publicity, and contacts with the leading researchers in relevant fields. While the emphasis will be shifted from contracted to in-house investigations, every effort will be made to locate funding for the investigation of promising new concepts when the originators wish to participate in their development or unique training (not available at LeRC) is required. An overguidelines request is being submitted to fund these efforts which include continuation of some of the investigations initiated in FY-82

W83-70166

506-55-13

Langley Research Center, Hampton, Va
ADVANCED RADIANT ENERGY CONVERSION

E J Conway 804-827-3781

Advanced radiant energy conversion research is in direct support of space power technology for the future and provides the basic efforts needed to achieve significant advances. Through this research, promising concepts are systematically explored, and the critical technologies involved in determining fundamental feasibility are generated. This work provides the underlying understanding required to advance our capability to explore and use space. The program objectives are to assess advanced concepts for space energy generation, conversion, storage, and distribution, and to develop the key technologies required to determine their feasibility. This includes investigating direct conversion of fission and solar energy into laser radiation, generating and investigating novel means to convert solar and laser radiation efficiently to electricity, or other useful forms of energy, and assessing the technology status and potential applicability of known and proposed advanced energetics concepts, and demonstrating feasibility of selected technologies. This program is a combined experimental and theoretical efforts performed in-house and on grants and contracts. The core of the program is in-house, and is composed of three efforts lasers, converters of laser energy to electricity, and new concepts. The program will also investigate additional concepts such as a high-current switch and a droplet thermal radiator

W83-70167

506-55-15

Jet Propulsion Laboratory, Pasadena, Calif TECHNOLOGY OF ADVANCED CONCEPTS

R M Jones 213-354-6674 (506-55-12, 506-55-13)

The objective of this RTOP is to identify, evaluate, and if justified, recommend for additional OAST funding, innovative advanced concepts in the areas of energy collection, conversion, transmission, and storage which show promise of enabling or significantly enhancing future space power systems The feasibility of new and existing concepts will be evaluated For the purposes of this RTOP, technical feasibility is defined to have three components (1) an understanding of the basic physics of the concept, (2) a demonstration of key performance parameters, and (3) an understanding of the system implications of the concept Once the technical feasibility of a concept has been established, a recommendation for separate funding outside of the RTOP will be made for concepts that promise substantial payoff

W83-70168

506-55-22

Lewis Research Center, Cleveland, Ohio **ELECTRIC PROPULSION TECHNOLOGY** Thomas H Cochran 216-433-6897

The overall objective of this program is to conduct research on, and develop technology for electric propulsion systems for future earth orbital and planetary missions. Applications include auxiliary propulsion for dense geosynchronous spacecraft and large space systems and primary propulsion for orbit maneuvering, orbit transfer, and planetary probes The kinds of propulsion systems considered will include ion thrusters, electrothermal rockets, and electromagnetic devices. The program consists of analytical and experimental efforts. Mission studies will be conducted to establish the performance potential of specific propulsion concepts Research will be carried out to understand basic physical processes and to establish the feasibility of specific approaches. Focused technology activities will be directed toward characterizing the performance, lifetime, and interfaces of critical system elements such as thrusters and power processors Work will be performed in-house, on contract, and with university grants

W83-70169

506-55-25

Jet Propulsion Laboratory, Pasadena Calif ELECTRIC PROPULSION THRUSTER SUBSYSTEM R&T V Pawlik 213-354-3455

The long term objective of this RTOP is to perform fundamental research into the controlling physical processes involved in advanced electric propulsion concepts such as the magnetoplasmadynamic (MPD) accelerator The FY-83 objective is to complete the preliminary technology evaluation of the MPD thruster and then embark on technology development leading to an MPD laboratory system demonstration. Specific thruster performance goals for this program include thruster exhaust velocities between 10 to 30 km/sec, thrust efficiencies of 50%, and system lifetime commensurate with projected applications including both near-earth and deep space applications. This effort will, early in FY-83,

establish the fundamental viability of the MPD thruster by demonstrating that the problems limiting performance and lifetime can be resolved Technology development of a laboratory thruster system will then be initiated with efforts on energy storage, thruster optimization, and propellant valve development. The approach will be to (1) conduct thruster erosion studies (2) improve thruster efficiency by conducting research into extending the MPD thruster operating range, and (3) develop an electrolytic capacitor for use in an MPD thrust system and investigate methods for improving thruster efficiency, design and test a propellant valve for use with an MPD thrust system, and explore feasibility of self switched thruster

W83-70170

506-55-42

Lewis Research Center, Cleveland, Ohio PHOTOVOLTAIC RESEARCH AND TECHNOLOGY

H W Brandhorst 216-433-4000

The objective of this RTOP is to improve conversion efficiency, reduce mass and cost and increase the operating life of solar cells and blankets Research and technology programs cover diverse areas Emphasis will be placed on understanding and reducing the radiation damage suffered by high efficiency silicon solar cells and exploration of means to heal this damage by low temperature annealing. Development of gallium arsenide solar cells for space applications will continue with special attention devoted to ultra lightweight cells less than 10 microns thick and durable high efficiency cells designed for sunlight concentration levels of 100 times in miniature Cassegrainian concentrator structures Efforts to develop cascade cells made from III-V semiconductor materials and having the potential for 30% conversion efficiency will continue and be augmented by the development of elements of mechanically stacked cascade structure. Concepts utilizing the wave nature of light will continue to be explored theoretically and experimentally A major program to develop reliable, low-earth-orbit durable welded solar cell interconnects will continue and be augmented to include array design

W83-70171

506-55-43

Langley Research Center, Hampton, Va SOLAR CELL RESEARCH

E J Conway 804-827-3781

This program, through in-house, grant, and contract research, developed the first laboratory GaAs cell having AMO efficiency greater than 18 percent, developed the first elevated temperature (> 200 C) GaAs solar cell, and pioneered in studies of electron and proton radiation effects and of thermal annealing for GaAs. The program now emphasizes generation of new cell concepts and photovoltaic techniques. This basic research effort is broadly oriented toward developing the technology to improve conversion efficiency, reduce mass, reduce cost, and increase the operating life of solar cells for space. Potential space applications include high power space manufacturing stations, near-Sun exploration, long-life space platforms, and GEO missions. A key research emphasis involves exploration of new photovoltaic and energy conversion materials This program continues research on thin crystal p-n junctions for high power-to-weight ratio space solar cells. The goal is to achieve a GaAs solar cell with a specific power of approximately 700 W/kg Liquid phase and chemical vapor deposition epitaxial growth techniques are employed to develop these improved cells. The long-term stability of cells and contacts at 200 C is studied to support concentrator and continuous annealing modes of operation. New contact materials are systematically studied

W83-70172

506-55-45

Jet Propulsion Laboratory, Pasadena, Calif HIGH PERFORMANCE SOLAR ARRAY RESEARCH AND TECH-NOLOGY

Walter A Hasbach 213-354-6132

The primary objective of this RTOP is to develop and demonstrate high performance solar array technology suitable for future NASA missions. The technology is focused on providing 300 W/kg arrays for GEO applications, but can also provide arrays which are superior, with respect to specific power (W/kg) and power per unit area (W/sq m), to those now considered for low Earth orbital (LEO), high Earth orbital (HEO) and interplanetary mission applications. As an intermediate objective (FY-84), a 150 W/kg array suitable for HEO and GEO missions will be demonstrated Processes will be demonstrated for assembling high efficiency, ultrathin (50 microns or less) silicon solar cells into space qualifiable blankets. By combining such innovations as gridded back contact cells, transparent polymer polyimide coatings and welded ultrathin (< 25 microns) interconnects, blanket specific power approaching 500 W/kg will be achieved provided that solar cells > 15% AMO are available A low mass, high strength array structure (STACBEAM), expressly designed for high performance blankets will be fabricated and integrated with the blanket to provide an array which has the potential to achieve 300 W/kg BOL for a GEO space environment

W83-70173 506-55-49

Marshall Space Flight Center, Huntsville, Ala MULTI-KW SOLAR ARRAYS

William L Craptree 205-453-2110

The objective of this RTOP is to advance the state-of-the-art in multi-kW solar arrays for earth orbit, it is necessary for support of future NASA missions such as space station. This RTOP will be a combination of in-house contracted efforts and will consist of the following tasks (1) low cost multi-100 kw Solar Array Preliminary Design and Technology Defficiency Identification and Development. (2) investigation of theoretical concepts for power generation, and (3) materials evaluations for Earth Orbital solar arrays

W83-70174 506-55-52

Lewis Research Center, Cleveland, Ohio ELECTROCHEMICAL ENERGY CONVERSION AND STORAGE L H Thaller 216-433-5260

The objective of this program is to attain long-life, high-energy density, high-reliability and lower-cost electrochemical storage and conversion devices. The emphasis is on devices that will be required for future space missions. The current focus is on technology for space station applications. This emphasis will be conducted within the framework of multi-year plans which take into account the needs of user groups and the efforts of other NASA centers as well as the Air Force The approved Nickel-Hydrogen Plan and the Fuel Cell Plan, now in the final stages of review, describe the task areas and major milestones for these coordinated efforts. The work in nickel-hydrogen aims at firmly establishing the component technology of current cell designs as well as investigating advanced cell design concepts applicable for multi-kilowatt systems The ongoing technology efforts in alkaline hydrogen/oxygen fuel cells and water electrolysis will continue to emphasize combined fuel cell-water electrolyzers for large low earth-orbit energy storage applications Efforts will also be maintained toward the goal of providing advanced technology fuel cell components for improved orbiter-type hardware as well as for orbital transfer vehicle-type applications. The in-house efforts relate to electrode, separator, and component technologies to support these two major parts of the multi-kWh storage effort. Chemical compatibility and pore size engineering of cell components are key Synthetic battery cycling and system assessments continue to provide guidance to the program

W83-70175 506-55-55

Jet Propulsion Laboratory, Pasadena, Calif
ADVANCED ELECTROCHEMICAL SYSTEMS

I Stein 213-354-6048

The overall objective of this RTOP is to achieve improved performance, energy density and lifetime of space batteries for applications in earth orbital and interplanetary missions. Objectives for the advanced electrochemical storage cell concepts task are to complete the final report which describes the fundamental understanding of failure mechanisms in Ni-Cd cells, to determine feasibility of beryllium electrodes in a stable, high specific energy primary cell, and to determine the feasibility of the new polymeric electrodes in high power, high specific energy secondary cells. Objectives for the primary lithium battery task are to identify hazardous reactions that take place during reversal, demonstrate utility of accelerated testing, and demonstrate quality of materials of construction. The secondary lithium batteries task objectives are to identify and understand the dominant mode of performance degradation of Li-TiS2 cells on cycling, and to identify improved cell components. The respective approaches to each of the tasks will be (1) perform laboratory tests on beryllium passivation behavior in high dielectric electrolytes, and determine the electrochemical properties of selected and doped polymers, and the effect of various electrolytes on polymeric electrode stability, (2) conduct chemical, electrochemical, and thermal investigations to identify the reactions, as well as demonstrate utility of accelerated testing, and (3) conduct chemical and electrochemical investigations of the degradation of cell components, with emphasis on the electrode/electrolyte interfaces The effects of modifications of the cell components on cell performance and component degradation will also be studied

W83-70176 506-55-57

Lyndon B Johnson Space Center, Houston, Tex
ORBITAL ENERGY STORAGE AND POWER SYSTEMS
Hoyt McBryar 713-483-2783

The objective of this research effort is to advance fuel cell and electrolysis cell technology to maturity and to demonstrate suitability to large orbital energy conversion and storage requirements of high power and long life A data base will be developed at the cell, small stack, and component level. This will provide the basis for design of the larger developmental test articles. An interim test will be conducted on breadboard-type hardware of about 4 kw in the integrated mode to

verify concept feasibility. This will also serve as a test bed to help define technology limitations and to evaluate interaction phenomena of dissimilar fuel cell/electrolysis cell concepts. Engineering model hardware will be fabricated which incorporates all technology advances for field demonstration of technology readiness. The results will provide a basis for selection of the regenerative fuel cell over other potential concepts for large orbital energy storage systems.

W83-70177 506-55-65

Jet Propulsion Laboratory, Pasadena, Calif
THERMAL TO ELECTRIC ENERGY CONVERSION TECHNOLOGY
G Stapfer 213-354-3922

The overall objective is to develop thermal-to-electric direct energy conversion technology to provide space power for near Earth missions as well as the exploration of the solar system. The RTOP is divided into three areas. The objective of the first task is to demonstrate the feasibility of a prototype thermal-to-electric conversion system (SP-100) for solar-independent high power (100 kwe) applications. The objective of the second task is to develop high efficiency thermoelectric conversion alloys capable of operating at elevated temperatures for long periods of time. The objective of the third task is to demonstrate the feasibility of highly efficient thermoelectric energy conversion devices operating at lower temperatures for use with radioisotope heat source. These tasks are to be accomplished by conducting studies and developing basic components required such as thermal insulation, radiator materials, and power regulation leading to technology verification consistent with reactor and heat pipe technology development. High temperature alloy development will be accomplished by developing new thermoelectric materials of the boron-carbon and the rare-earth sulfide system. The synthesis and property evaluation of these materials are fundamental prerequisites for successful thermoelectric alloy development. The approach in the thermoelectric conversion technology task is to develop new thermoelectric compounds by synthesizing the chromium-lanthanum sulfur material system and evaluate its potential for converter applications

W83-70178 506-55-70
National Aeronautics and Space Administration Washington, D C
SPACE ENERGY CONVERSION SUPPORT

J H Ambrus 202-755-3273

The objective is to provide support to the headquarters operation of the OAST Space Energy Conversion Program This will include (1) space energy conversion research at universities (2) operation of the multi-agency supported Power Information Center of the Interagency Advanced Power Group. (3) critical technology development efforts in the space energy conversion that are to be performed by other agencies (such as DOE)

W83-70179 506-55-72 Lewis Research Center, Cleveland, Ohio

POWER SYSTEMS MANAGEMENT AND DISTRIBUTION R C Finke 216-433-5232

The objective is to provide the technology base necessary to control the generation and distribution of energy in future space systems and to assure their environmental compatibility. The proposed work will define and develop the generic technology to enable large multi-kilowatt power systems in space In-house and contractual studies will be conducted, as needed, to determine performance requirements, system constraints, and new technology needs for future space power systems. Contract, grant, and in-house experimental and analytical programs will be conducted to explore the basic physics of conductors, semiconductors, dielectrics, and magnetic and thermal materials for power devices, develop an analytical model of their operating principles, and develop working prototypical devices, demonstrating them and characterizing performance in typical circuits as required. In addition, this program will perform ground tests to simulate and determine the impact of the environments on spacecraft systems, develop models of the physical phenomena, and define space tests to verify ground test data

W83-70180 506-55-76

Jet Propulsion Laboratory, Pasadena, Calif

SPACECRAFT POWER SYSTEMS R & T

P A Robinson 213-354-3882

The general objective of this RTOP is to develop the technology for controlling space plasma interactions with high voltage spacecraft surfaces. This activity is part of a joint AF/NASA comprehensive research and technology program. This technology will be required to provide design information for large spacecraft and high power modules. The design of a space station will require this technology base, both because of it's size and use of high power modules. Specific objectives for FY-83 will include (1) develop statistical models of the low earth/low latitude cold plasma environment. (2) RF characterization of low voltage arcs. Specifically, this effort will provide information on the low energy

plasma environment near the Earth, study charged particle effects on spacecraft and solar array surfaces, and identify methods to incorporate charge release devices which are under development by the Air Force Geophysics Laboratory (AFGL) The approach will be divided into two major tasks. The environment modeling and arc characterization task will address specific objectives (1) and (2) by modeling the near earth plasma environment and characterizing the EMI signature of arcs induced by high energy electrons

W83-70181 506-55-76

Goddard Space Flight Center, Greenbelt, Md ADVANCED POWER SYSTEM TECHNOLOGY

L W Slifer 301-344-8841

The basic objective for this RTOP is to convert advanced power technology R&D accomplishments at the various NASA centers and at other agencies (DOD, DOE) to a state of readiness for future flight applications. The approach includes the overall assessment of R&D status, the evaluation of technology advancements in terms of potential for flight application, the completion of engineering development necessary to bring high potential advancements to technology readiness, and the analysis of power systems incorporating the advanced technology. The RTOP consists of six tasks (1) power technology assessment (2) analytical modeling of power systems (3) assessment of nickel-hydrogen cell technology. (4) development of spacecraft power system utilizing inertial (flywheel) energy storage (5) forecasting of high voltage insulation performance, and (6) development of high density thermal transport devices

Lyndon B Johnson Space Center, Houston, Tex

THERMAL MANAGEMENT FOR ON-ORBIT ENERGY SYSTEMS J G Rankin 713-483-4941

The objective of this RTOP effort is to (1) develop the technology necessary for thermal management of a large space station, (2) extend orbital lifetime capability of thermal management systems from months to several years, (2) provide the technology necessary for high energy density heat collection and transport, and (4) reduce the cost of very large scale heat rejection systems by orders of magnitude. This will be achieved by establishing the technology for the design, fabrication, and test of hardware comprising a representative portion of a full scale system Such a system might consist of a pump assisted heat pipe providing a constant temperature 'thermal bus' or energy transport loop that would deliver or receive heat to/from the various subsystems and payload heat sinks or sources via one or more types of modular (i.e., easily connectable/removable) thermal interface devices (contact heat exchangers, fluid or heat pipe quick disconnects, etc.) The primary heat sink for such a system could be made up of relatively simple independent radiator elements containing large high-capacity dual-passage heat pipes that would provide a space constructable radiator system with long life due to low system vulnerability to the micrometeoroid environment

W83-70183 506-55-79 Marshall Space Flight Center, Huntsville, Ala MULTI-100 KW LOW COST EARTH ORBITAL SYSTEMS

J R Graves 205-453-2514 (506-55-62, 506-64-19)

The objectives of this RTOP are to provide the technology required to process, distribute, and control electrical power in multi-100 kW type platform systems and to reduce space energy costs through automation and improved efficiency, life, reliability, and maintainability These objectives will be accomplished via a combination of in-house and contracted efforts and will consist of the following tasks (1) develop power processing, conditioning, and distribution techniques for high voltage, multi-100 kW power systems, (2) develop automation techniques and utility-type power management and control for large space power systems, (3) construct a DC and an AC system breadboard for evaluation and demonstration of new technologies and power management techniques. These tasks will be coordinated with space platform studies conducted under RTOP 506-64-019

Multidisciplinary Research

W83-70184 National Aeronautics and Space Administration, Washington, D.C. MULTIDISCIPLINARY RESEARCH

J H Ambrus 202-755-3273

The objective is to conduct basic research in selected areas of a broad range of scientific and engineering disciplines in order to underpin advanced space technology The major emphasis will be to conduct

fundamental investigations in focused areas of enabling technology for advanced space missions. The approach is to grant multiyear funding to universities in order to build centers of excellence and to train scientists in fields of particular interest to NASA. A specifically selected area is high temperature thermoelectric materials (Stanford) Also emphasized will research to utilize space as a unique scientific laboratory and conduct basic research experiments that would advance scientific understanding of basic principles not obtainable in earth bound laboratories. This idea has been started and carried out for a number of years under the title of Physics and Chemistry Experiments in Space (PACE) The plans are to involve a broad scientific community and solicit new ideas

Controls and Human Factors

506-57-13

Langley Research Center, Hampton, Va SPACECRAFT CONTROLS AND GUIDANCE Lawrence W Taylor, Jr 804-827-4591

The objectives are to develop devices and advanced techniques for the analysis and synthesis of control systems for large space systems, particularly for pointing, active damping, and figure control. Advanced techniques will be formulated, applied to specific spacecraft designs, and tested using ground and flight experiments. Advanced techniques pertain to distributed parameter system modeling and control reduced order modeling theory, systems identification and parameter estimation, computer aided design, fault tolerant control synthesis, adaptive control, and shape control

W83-70186 506-57-15

Jet Propulsion Laboratory, Pasadena Calif ADVANCED CONTROL TECHNOLOGY

A F Tolivar 213-354-6215 The long range objectives of this RTOP are to identify and develop fundamental control system design, analysis, components, and testing

techniques required for the control of advanced spacecraft (including Earth-orbiting large antennas, space stations, and platforms) and for the control of space transportation vehicles. This RTOP encompasses the following eight major tasks (1) control system synthesis - develop and evaluate control system designs for large antennas, for the large deployable reflector, and for space stations, (2) distributed control develop fundamental control analysis and design technology for spacecraft systems which must be described by distributed parameter dynamical models, (3) applied systems identification - develop algorithms, software, and system concepts for off-line and real time characterization of spacecraft statics (figure) and dynamics (frequencies, modeshapes), (4) adaptive control - develop and demonstrate autonomous model error estimation and adaptive control techniques needed to compensate for the inevitable model and parameter uncertainties. (5) control technology validation - conduct ground demonstration of specific concepts in the laboratory and the definition of a control flight experiment including mission goals and objectives, preliminary system design and trades (6) advanced guidance and control components - develop a long life laser gyro and an optical sensor for determination of the static shape and vibrational motion of flexible spacecraft (7) advanced STS control develop advanced STS control system concepts for expanded STS control envelope needed for on-orbit control of modular and flexible bodies, and (8) basic research grants - to sponsor university research in advanced concepts involving identification theory in random fields and distributed systems with long term application to modeling and control of flexible systems

W83-70187 506-57-17

Lyndon B Johnson Space Center Houston, Tex STS CONTROL AND GUIDANCE TECHNOLOGY DEVELOPMENT J Cox 713-483-4281

The objective is to develop and assess guidance and control (G and C) concepts and techniques to provided needed capabilities for the full utilization of current and future space transportation systems (STS) Methodologies for the cost effective development and implementation of advanced G and C capabilities will also be evaluated. Implementation approaches which result in highly reliable G and C capabilities will be investigated. Four major tasks are included. (1) methodology for STS control envelope definition/expansion, (2) software development interactive with system development, (3) expendable replenishment for on-orbit servicing, and (4) space vehicle control and guidance technology development support. The approach is to address the G and C technology needs across interacting elements of STSs (e.g., space shuttle, orbit transfer vehicles, teleoperators) Studies will be directed toward technology development which have the broadest application to these elements and which integrate the requirements and constraints associated with the interactions of these elements Emphasis will be placed on the development of G and C technologies supporting STS on-orbit operations and services

W83-70188

Marshall Space Flight Center, Huntsville, Ala

LARGE SPACE SYSTEMS TECHNOLOGY CONTROL AND GUIDANCE

H J Buchanan 205-453-4582

The objective of this research will be to define, develop, and demonstrate control techniques and devices required for future space platforms, stations, advanced earth orbiting spacecraft, and advanced space transportation systems. Tasks covered include. (1) large space system control technique development and verification (2) modular control techniques, (3) autonomous momentum management for space stations as well as (4) control and sensing for autonomous rendezvous and docking (5) over-uprated find guidance sensor. Outputs from these studies and development activities will provide technical data necessary for meaningful system trades and will generally support preliminary system definition work in the guidance and control area

W83-70189

506-57-21

Ames Research Center, Moffett Field, Calif SPACE HUMAN FACTORS H P Klein 415-965-5094 (505-35-21, 505-35-01)

Future manned space systems may place the operators in a position of having more autonomy and relying less on ground control. These missions will involve highly trained astronauts as well as other flight crew members and scientists. Maximum benefit from these future space systems will accrue where the abilities of the humans are fully exploited and their performance maximized with their errors reduced to a minimum The objective of this RTOP is to develop an understanding of the causes of human error which appropriately addresses the unique aspects of both individual and team operation in space. The program will initially focus on gaining the maximum benefit of past experience with space operations in addition to operations in other stressful environments which have similar characteristics to those encountered in space. Particular emphasis will be placed on bringing together current knowledge regarding operational problems. Using this knowledge, the first step in developing reliability model(s) for human operators in these future space systems will be initiated

W83-70190

506-57-23

Langley Research Center, Hampton, Va MANNED CONTROL OF REMOTE OPERATIONS A J Meintel, Jr 804-827-2489 (506-54-63, 506-64-23)

The objective of this plan is to study and develop through experimentation and analysis, the required controls and displays for efficient man-machine interface for control of remote systems and to apply advanced technology to enhance man's capability to accomplish remote operations by increasing his supervisory capabilities for complex automated systems. The research will be conducted using a reconfigurable remote control station coupled to a software simulation/laboratory hardware representing the remote system. Experimental studies will be conducted to determine human capabilities/limitations in teleoperation The remote control station will be reconfigured to evaluate the controls, displays, crew interactions, and systems interface requirements to provide enhanced sensory feedback for control and supervision of remote systems

W83-70191

506-57-25

Jet Propulsion Laboratory Pasadena, Calif TELEOPERATOR HUMAN INTERFACE TECHNOLOGY A K Bejczy 213-354-4568 (506-54-65, 906-75-27)

The general objective of this RTOP is to develop a data base and models for quantifying human performance in sensor- and computeraugmented information and control environment of space teleoperator systems in order to advance the state-of-the-art currently represented by the Shuttle RMS baseline technology. This objective includes the classification measurement and evaluation of human performance parameters related to (1) kinesthetic-proprioceptive man-machine coupling, (2) analog and symbolic man-machine communication, (3) perceptive/cognitive processes involved in online decision making as a function of alternative presentations of a given control task the FY-83 objectives are (1) publish a study on critical human performance parameters in space teleoperation (2) define, design, and develop laboratory experiments for evaluating human performance in kinestheticproprioceptive man-machine coupling, integrated task-referenced displays, and interactive manual and computer control of remote manipulators,

and (3) develop preliminary specifications for a space shuttle experiment for evaluating human kinesthetic performance in remote manipulator control under zero-g conditions. The general approach is experimental It creates, maintains, upgrades and utilizes experimental capabilities at the JPL teleoperator laboratory to generate the necessary data Function allocations between man and machine will be studied for various operational constraints, including time delays. New system and subsystem concepts will be developed and breadboarded when necessary Cooperation with other NASA centers and universities will be established

W83-70192

506-57-27

Lyndon B Johnson Space Center, Houston, Tex **HUMAN FACTORS FOR CREW INTERFACES IN SPACE** J L Lewis 713-483-2845

The objective of this RTOP is to develop technologies which will increase the effectiveness of man-machine interactions in space. Specific tasks include development of guidelines for displays and controls that will decrease operator workload and training requirements and will require less space and weight development of a portable terminal for a space station, and development of aids for performing extravehicular activities (EVA) Technologies to aid in the design of equipment and in operations planning will also be advanced. This includes development of models of human strength and motion in zero-g, and development of a laser-based three-dimensional mapping system which will provide descriptions of human bodies and human motion for a designer's data base. The approach will be to survey the current state-of-the-art to determine operational requirements, to build prototypes or models and collect data in one-g and zero-g conditions, and to generate design guidelines and designer aids on the basis of these tests. Existing facilities that will be utilized include an avionics test bed, the Operator Station Design System computer-aided design (CAD) system and data base, and the Anthropometric Measurement Laboratory data base and equipment for collecting and presenting reach, force, and motion data. These resources will be extended by addition of the mapping system and the strength and motion models. Additional data bases for tracking display and control technologies and results of prototype evaluations will be built

W83-70193 Marshall Space Flight Center, Huntsville, Ala

TELEOPERATOR AND EVA HUMAN FACTORS

F W Wagnon 205-453-4623

The objective of this RTOP is to (1) investigate and determine the role and the required degree of involvement of humans in space missions. (2) define and implement selected technology tasks relative to human factor requirements/benefits in the effective operation and utilization of teleoperators, and (3) define and evaluate human factor technologies required for crew station design, tools and crew aids as well as develop required guidelines and standards for effective and efficient man-in-the-loop space operations. These efforts will be accomplished through a combination of both in-house and out-of-house efforts. An in-depth survey study will be performed to, assess the present and ongoing developments in the area of human factors technology. This survey will enhance the data base and provide a datum or point of departure for the other task defined in this RTOP

Space Data and Communications Research and Technology

W83-70194

506-58-10

506-57-29

National Aeronautics and Space Administration, Washington, D.C.

ARCHIVAL MASS MEMORY Charles F Fuechsel 202-755-2364

(506-61-09)

The objective is to develop an on-line archival mass memory device capable of storing and retrieving up to 10 to the 13th power bits of information at rates up to 50M bits/second Laser-optical disk technology will be employed in concert with a mechanical manipulator to retrieve and mount individual disks

W83-70195

506-58-11

Ames Research Center, Moffett Field, Calif **FUTURE DATA SYSTEMS CONCEPTS**

T L Grant 415-965-6526

The objective of this RTOP is to advance the state-of-the-art in data network tuchnology through analysis of general concepts and the implementation of software simulation to define, develop, and evaluate detailed concepts, including promising coding designs. The emphasis in this technology development is on reduced system complexity for data

networks and on increased reliability while providing the flexibility to expand data capacity as processing requirements increase. A network simulation capability is planned via software models using the Ames Research Center computational facilities It will provide a test bed for developing and evaluating detailed conceptual designs as well as augmenting the analysis of general network concepts. After the system requirements and evaluation criteria are defined, various data networks will be modeled in coordination with other Centers. The software simulations will also be used to evaluate coding designs which will be developed for added capacity and error-free data distribution

506-58-13

Langley Research Center, Hampton, Va

DATA SYSTEMS RESEARCH AND TECHNOLOGY

N D Murray 804-827-3535

The primary objective of the Data Systems Research and Technology activity is to investigate research, and develop key technologies for (1) real-time, very high-speed data and information processing onboard spacecraft, (2) high density, high speed data storage for onboard spacecraft, and (3) network architectures and optical buses to attain high performance processing, communications, and distribution of information onboard a space station. To address the onboard real-time information processing, the information adaptive system (IAS) is being developed to process multispectral images, and the IAS will be extended to include processing of spatial image data for space station, processing algorithms unique to space requirements are being developed, and VLSI/VHSIC integrated circuits are being investigated and designed for space applications. The main thrust of the onboard data storage activity is the development and demonstration of highly reliable, advanced magnetic bubble memory devices and system prototypes. This activity is composed of two elements ion implanted, magnetic bubble memory development and current-accessed self-structured bubble memory development. The network and optical bus activity is oriented to the development and demonstration of optical components, wavelength division multiplexing subsystems, and network architecture systems, which are directed toward meeting space station requirements

W83-70197

506-58-15

Jet Propulsion Laboratory, Pasadena, Calif.

DATA SYSTEMS RESEARCH AND TECHNOLOGY

T C Duxbury 213-354-4889 (506-54-05, 506-54-06, 506-54-15)

The objectives of this RTOP are to develop and demonstrate the systems technology and techniques which enable more efficient and effective transfer of useful data from the sensor to the user, and facilitate sensor control by a distributed body of users at substantially reduced cost and complexity with emphasis directed toward the requirements of manned space station missions such as fault tolerance and subsystem autonomy. The approach to meeting these objectives includes in basic research spacecraft and space station technologies Basic research will extend the theoretical basis for modeling and translating data structures between heterogeneous data bases and will advance optical transmission and processing technology Spacecraft efforts will develop very high speed processing of on-board synthetic aperture radar imaging by ground-based facilities. Additionally space station efforts will concentrate on developing advanced data system architectures which are readily adaptable in flight to changing mission requirements and which provide automatic detection and recovery from component failure in flight. This architecture will provide relative insensitivity to evolving device technologies and localize the effects of changes within subsystems to reduce the costs and complexities of system-level integration testing and verification

W83-70198

506-58-16

Goddard Space Flight Center, Greenbelt, Md DATA SYSTEMS RESEARCH AND TECHNOLOGY

R W Nelson 301-344-7809

The program objective is to develop and demonstrate the systems technology and techniques which can enable more efficient and effective transfer of useful data from the sensor to the user, extraction of information by the user, and exchange of information between users. The approach will be to conduct a continuing systems analysis to guide and evaluate the program, to develop new subsystems and operations concepts, and to implement and test demonstrate prototype elements of the end-to-end system

W83-70199

506-58-19

Marshall Space Flight Center, Huntsville, Ala ON-LINE DATA INGEST/STAGING SYSTEM

T Thomas 205-453-3577

The objectives are to (1) develop technology to enable very rapid processing of large volumes of space sensor data by ground-base facilities.

(2) reduce the cost of processing and storing information by several orders of magnitude, while increasing the lifetime of storage media, and (3) evaluate the feasibility of adapting and applying this high density storage technology to flight systems

W83-70200

506-58-22

Lewis Research Center, Cleveland, Ohio

SATELLITE COMMUNICATIONS RESEARCH AND TECHNOLOGY

R E Alexovich 216-433-6689

(650-60-21 506-54-12, 650-60-20, 650-60-22)

The objective is to provide through research, design, and experimental tests the components, subsystems and enabling technology required to support NASA satellite communications systems. To achieve this objective, advanced research and development programs will be conducted to identify, produce, and demonstrate critical components, techniques and subsystems required for complete communications systems. Principal emphasis will be directed toward spacecraft microwave electron beam amplifiers with increased power output, efficiency high frequency capability and long life, multi-frequency, multibeam antennas providing increased frequency reuse, and solid state materials and component technology for high frequency spacecraft applications, such as switching, power amplification and beam forming

W83-70201

506-58-23

506-58-25

Langley Research Center, Hampton, Va MULTIPLE BEAM ANTENNA TECHNOLOGY DEVELOPMENT PROGRAM FOR LARGE APERTURE DEPLOYABLE REFLECTORS Thomas G Campbell 804-827-3631

The overall objective of this RTOP is to specifically address the development of multiple beam antenna technology and analysis methods that are critically related to the technology development activities of the deployable reflector concepts presently funded by Code RS or OAST The development of multiple beam feed technology that is specifically related to the large aperture antenna development will eventually provide NASA the capability of predicting the total antenna system performance characteristics for a wide range of mission applications (communication, radiometer, and radio astronomy) Primarily, this activity shall provide a top-level basis for determining the effectiveness of large off-set reflector systems (with up to 200 beams) that are presently being considered for communications and radiometer near-term and far-term missions Tasks to be accomplished include the development of the feed requirements for communication and radiometer (PBMR,) missions for multiple beams and multiple apertures, antenna configuration design for the point design, multiple beam antenna feed point design, and derivation of secondary illumination and multiple beam contour for co-polar and cross-polar plots, spherical near-field testing using subscale models

W83-70202

Jet Propulsion Laboratory, Pasadena, Calif DEEP SPACE AND ADVANCED COMSAT COMMUNICATIONS **TECHNOLOGY**

J F Boreham 213-354-4107
This RTOP represents the consolidation of two prior RTOPs namely Deep Space Communications Technology (DSCT) (formerly called High Speed Data Transfer X/S Band Components) and Advanced Communications Satellite (ACS) Technology Research and Development (formerly called Earth Satellite Communication Antenna Development) The general objectives of this RTOP are to develop microwave communications system component technology to support space-to-earth data distribution/transfer requirements of NASA's future deep space missions and ACS type missions. The objectives in the DSCT area center on the development of solid state microwave power amplifiers as replacement for the expensive and relatively unreliable TWTA's, while in the ACS area they center around large multibeam antenna technology development. More specifically, during the first quarter of FY-83 a 10/22 watt X-band solid state power amplifier (XSSPA) using high efficiency (> 35%) 1 and 2 GaAs FETs will be evaluated and demonstrated and by the end of FY-83 development of key components of a 20/40 watt XSSPA using high efficiency 4W GaAs FETs will be completed in FY-84 the 20/40 watt XSSPA will be evaluated and demonstrated and development of a high power array feed power amplifier based on prior technology developments of this RTOP will be initiated in the ACS area, more specific objectives for FY-83 and FY-84 include (1) complete the development of design concepts for contiguous multiple beam antennas/feeds (2) continue the updating of software necessary for designing and predicting performance of advanced antenna systems, and (3) initiate the development of ground and in-flight RF measurement techniques for large spaceborne antennas

W83-70203 506-58-26

Goddard Space Flight Center, Greenbelt, Md
COMMUNICATIONS: TDRSS FOLLOW-ON/INTERSATELLITE
LINKS

J S Chitwood 301-344-6375 (506-54-42)

The program objective is to advance microwave technology in data transfer techniques to satisfy the communications requirements of future space flight programs. Microwave and millimeter wave spacecraft components, techniques, and circuits will be developed to support flight programs characterized by high data rates, simultaneous multiple links, and reliable long life operation. High data rate solid state transmitters, low noise receivers, and millimeter wave antenna systems will be developed.

W83-70204 506-58-27
Lyndon B Johnson Space Center Houston, Tex
SPACE STATION COMMUNICATION TECHNOLOGY

Max Engert 713-483-2872

The objective is to bring communications technology, which is primarily in support of hardware implementations on a permanently manned space station, to a proper state of technology readiness Expected accomplishments include (1) reduction of the communications system life cycle cost including cost of impacts due to incremental growth, (2) significant reduction in space station operational compromises, and (3) reduction of programmatic risk for unique space station communication requirements. Technical target areas include intra-vehicular communications, RF equipment (transmitters, receivers, antennas), and ranging/tracking systems Extensive breadboard developments will be evaluated in the JSC Electronic Systems Test Laboratory providing total end-to-end system performance evaluation including the effects of relay satellites, ground stations, and other space vehicles

Chemical Propulsion Research and Technology

W83-70205

506-60-10

National Aeronautics and Space Administration, Washington, D C CHEMICAL PROPULSION R&T INTERAGENCY SUPPORT

F Stephenson 202-755-2490

The primary objective of this activity is to maintain a continuous up-to-date information gathering capability on the nation's total chemical propulsion technology efforts as an aid in planning admirplementing the NASA program. In addition, joint interagency tasks are undertaken when appropriate, such as publishing handbooks, manuals, or computer models, that will be beneficial to the propulsion community as well as other potential users. The approach is to share support of the Chemical Propulsion Information Agency (CPIA), which supplies information gathering and dissemination services, with the DOD agencies through the Joint Army, Navy, NASA, Air Force (JANNAF) Interagency Propulsion Committee. For special interagency tasks, funding is transferred to the agency designated as responsible for the procurement action and contract monitoring.

W83-70206

506-60-12

Lewis Research Center, Cleveland, Ohio

EARTH-TO-ORBIT PROPULSION LIFE AND PERFORMANCE TECHNOLOGY

D A Petrash 216-433-6860

(506-52-19)

The driver for future Earth-to-orbit launch vehicles will be advanced high pressure liquid rocket engines used for the main propulsion system. These propulsion systems will have to provide the lowest possible life cycle costs while meeting the needs of all potential users. The objective of this program is to extend the existing technological base established by the space shuttle main engine and older hydrocarbon fueled engines to provide the knowledge for reusable, long life, serviceable, high performance engine systems using either hydrogen-oxygen or hydrocarbon-oxygen. This effort will concentrate on thrust chamber cooling and life enhancement, critical turbomachinery components including bearings, seals, turbine blades, rotordynamics diagnostic techniques, and improved materials. This work will be accomplished through studies, analytical models, fundamental subscale testing, and correlation of all inputs.

W83-70207

506-60-17

Lyndon B Johnson Space Center, Houston, Tex
ADVANCED MANNED VEHICLE ONBOARD PROPULSION
TECHNOLOGY

R W Polifka 713-483-5557

The objective of this effort is to identify viable propulsion system designs and propellant alternatives which could replace N2O4/MMH in a second generation shuttle auxillary propulsion system or similar advanced spacecraft propulsion systems, and to establish the technology base necessary to allow for future systems development Phase out of N2O4/MMH become necessary due to handling health hazards, high propellant cost, and high corrosivity of these propellants. The oxygen-hydrocarbon propellant family provides the most attractive alternative Oxygen-hydrocarbon type propellants will be characterized and system design and trade studies conducted. Propellant and design selections will be made and critical component technology and technology issues will be identified. Component technology will be developed and carried forward into assembly level test evaluation.

W83-70208

506-60-19

Marshall Space Flight Center, Huntsville, Ala **REUSABLE HIGH PRESSURE MAIN ENGINE TECHNOLOGY** S F Morea 205-453-3908

(506-52-12)

Advanced reusable booster engines required for Earth-to-orbit application are being investigated. The overall objectives are to (1) advance the technology base for future oxygen/hydrocarbon booster engines and (2) advance the technology in support of future space shuttle main engine (SSME) improvements. More specifically, technology for advanced high pressure oxygen/hydrocarbon rocket engines for booster application is being pursued and includes single-fuel, dual-fuel and dual-throat concepts. These activities include engine power cycle synthesis, parametric data generation, component performance prediction and evaluation, and combustor and turbine cooling investigations. These efforts include data screening, analysis, computer modeling, hardware design and fabrication, data evaluation, and test. As the SSME program approaches operational status, specific technology activities are required for resolution of persistent trouble areas and for improving life and reducing operating cost. The effort necessary to accomplish these objectives is defined in the Advanced Research and Technology Plan, rev. June 1, 1982. The areas of investigation are basic in nature and are supportive of future SSME uprating and definition of advanced lox/hydrocarbon engines

W83-70209 506-60-25

Jet Propulsion Laboratory, Pasadena, Calif
ADVANCED LOW THRUST CHEMICAL PROPULSION TECHNOLOGY

M W Dowdy 213-354-2182 (506-64-25)

The general objective of this RTOP is to provide technology for advanced on-board spacecraft chemical propulsion systems which will find application on Earth-orbiting space stations and satellites as well as planetary spacecraft. Specific objectives relevant to the FY-83 efforts are (1) assess technology readiness of propulsion system options for space station, (2) evaluate development potential of ultra high performance propulsion concepts. (3) formulate technoloy development plan for low thrust (30-100 lb(f)) gaseous O2/H2 propulsion system for a space station, (4) develop validated plume contamination model. and (5) provide propellant/material compatibility data base for advanced propulsion systems. A technology assessment of propulsion system options for a space station will be conducted and most promising options and critical technologies identified Contractor studies and a proof-ofconcept experiment will be used to identify best advanced propulsion concepts. Following a system requirements definition phase, a contractor effort will formulate a preliminary gaseous O2/H2 thruster design for a space station and identify critical technologies. An electric motor-pump will be tested and a technology development plan established. A molecular beam experiment will be conducted to measure sticking coefficients for use in plume contamination models. The on-going long-term propellant/ material compatibility task for Earth storable propellants will be expanded to include the new formable material, Ti-15-3(3), and tests will be initiated in the new cryogenic materials compability facility

W83-70210

506-60-42

Lewis Research Center, Cleveland, Ohio VARIABLE THRUST OTV PROPULSION TECHNOLOGY D A Petrash 216-433-6860

(506-60-49)

The objective is to provide technology for improving performance, life, and reusability of future highly versatile liquid chemical rocket engines in order to greatly extend mission capability and flexibility in performing orbital operations reliably and at reduced operating costs. The propulsion

systems that will be investigated include a highly versatile, throttleable, reusable, and maintainable high thrust rocket engine and a high performance low thrust expendable rocket engine. Emphasis of the work will be on combustion, cooling, and heat transfer, performance enhancements, long life bearings and seals, lightweight reusable components, small high performance combustors and pumps, high expansion area nozzles, and propellant management.

W83-70211

506-60-49

Marshall Space Flight Center, Huntsville, Ala
OTV PROPULSION PERFORMANCE AND PLUME CHARACTERIZATION

R J Richmond 205-453-3710

(506-52-42)

Advanced reusable oxygen/hydrogen engines required for future orbit-to-orbit vehicles are being investigated. The activities include advanced engine power cycle analysis and synthesis, technology identification and acquisition, component and system performance prediction model improvement and concept demonstration of a novel, jet engine driven, high altitude simulation test facility. These efforts include computer modeling, data screening, analysis, hardware fabrication, test, and data evaluation. Both low and high altitude plume flow field computer programs are being developed employing new technology in flow field methodology where applicable. These programs will not be restricted to hydrogen/oxygen but will be applicable to all currently envisioned propellant systems. In addition to the flow field programs, a state-of-the-art high altitude plume impingement analysis will be developed. Support will also continue for the JANNAF sponsored Plume Technology.

Spacecraft Systems Research and Technology

W83-70212

506-62-21

Ames Research Center, Moffett Field, Calif

STUDY OF LARGE DEPLOYABLE REFLECTOR FOR INFRARED AND SUBMILLIMETER ASTRONOMY

M K Kıya 415-965-6548

(506-61-31 506-61-41 358-41-06)

The objective of this RTOP is to assess and develop technologies for the large deployable reflector (LDR) Critical technologies have been identified in the feasibility and system concept definition study and at the 1982 Science and Technology Workshop Also, continuing systems feasibility studies will define LDR technology requirements and the implication of the status of the technology on the LDR system concept Several technologies identified and requiring development are segmented mirrors, figure and pointing control, thermal control, support structures, and deployment technique. The approach is to continue the technology assessment in the most critical areas and initiate development activities for mirror segments in FY-81 and for optical (alignment and figure) controls in FY-83. The end objective of this RTOP is to integrate the various LDR technologies into a demonstration proof of concept.

W83-70213

506-62-23

Langley Research Center, Hampton, Va
ADVANCED LARGE SPACECRAFT SYSTEMS ANALYSIS
L S Keafer 804-827-3666
(506-62-43, 506-64-13)

The long-range technical objective is to support development of advanced spacecraft systems for NASA science applications, DOD missions, and commercial ventures in space. The work includes mission, system and experiment concepts definition, technology analysis and needs assessment, and building of a versatile computer aided design and analysis capability for advanced spacecraft systems. Priority tasks for FY-83 involve (1) defining space flight experimental approaches for validation broadly applicable technologies, (2) further definition of Earth observation spacecraft, in particular a conceptual design of a hoop-column antenna spacecraft for microwave radiometry, (3) kinetic/kinematics analysis of deployment of various antenna configurations, and (4) controls-dynamics interaction study and development of first-order controls synthesization and analysis techniques. Primarily in-house mission, system and discipline expertise and analysis tools will be used to accomplish the definition and analysis tasks. Contractual work will complement the in-house effort in controls-dynamics studies, system evaluations, and detailed designs and analyses. The computer aided design capability will be augmented primarily by in-house development and software exchanges with industry

W83-70214

506-62-25

Jet Propulsion Laboratory, Pasadena, Calif

PLANETARY AEROCAPTURE SYSTEMS RESEARCH AND TECHNOLOGY DEVELOPMENT

M ! Cruz 213-354-5709

The objective of this RTOP is to bring to an orderly conclusion the planetary aerocapture systems research and technology development activity. The conclusion of planetary aerocapture will be in the form of a final report. This will document in a concise fashion all research and technology, and conceptual design efforts performed in the development of the generic planetary aerocapture systems.

W83-70215

506-62-49

Marshall Space Flight Center, Huntsville, Ala SOLAR ARRAY FLIGHT EXPERIMENT (SAFE) DYNAMICS & CONTROL AUGMENTATION (FLIGHTS 1 AND 2) Henry C Hill 205-453-3423

(542-03-04)

The major objectives of phase 1 (flight 1) are to develop and demonstrate the technology readiness of on-orbit remote sensing and data processing systems for subsequent use in large space structure dynamic response measurements, to process the data obtained from the remote sensing tests, and to define dynamic characteristics of solar arrays for correlation with theory, ground test data, and response control techniques applicable to large, flexible space systems

Transportation Systems Research and Technology

W83-70216

506-63-23

Langley Research Center, Hampton, Va

TECHNOLOGY REQUIREMENTS FOR ADVANCED SPACE TRANSPORTATION SYSTEMS

J P Arrington 804-827-3911

The objective of this RTOP is to identify, justify, and prioritize high leverage enabling and enhancing technologies for both current evolutionary and future new space transportation systems. This includes the projection of future transportation needs, the characterization of potential future mission and economic capabilities based on the design of advanced concepts, and the assessment of technology impact on desired transportation attributes. The approach focuses on the total transportation system, including both Earth-to-orbit and orbital transfer vehicles, which operate primarily within the geosynchronous sphere. The intent is to build on the space shuttle technologies which enhance the current Space Transportation System (STS) and enable new systems which have significant cost and/or capability advantages when they will be required as a second generation STS Technology areas of particular interest include composite and thermal protection materials, propulsion systems, structural design, aerothermodynamics, design integration, advanced flight control, and automated operations. This activity will be pursued through in-house system studies, selected in-house assessments, contracted system assessments, and intercenter reviews

W83-70217

506-63-27

Lyndon B Johnson Space Center, Houston, Tex AUTOMATION OF SPACE TRANSPORTATION SYSTEMS Max Engert 713-483-2872

The objective is to assess automations concepts and techniques applicable to advanced transportation systems. Concepts which provide ways of reducing the cost or enabling the performance of the high mission rates of the Shuttle Program (circa 1985 and beyond) will also be investigated. Selected areas are those involved in such mission operations as premission planning and flight execution support including anomaly analysis and response in near real time. A key task is the automation of the data base system which supports the flight operations. The approach is to direct automations related tasks at key space transportation areas involving labor intensive human involvement where advances in technology can make significant reductions in cost through increased overall system efficiency.

W83-70218

506-63-29

Marshall Space Flight Center Huntsville, Ala
CONCEPTUAL CHARACTERIZATION AND TECHNOLOGY
ASSESSMENT

R E Austin 205-453-2769

(906-63-04)

Aeroassist is a technological capability that has a potential ranging from significant mission enhancement (orbit transfer vehicle-OTV) to mission enabling (some planetary orbiters and DOD) Prior studies have

shown that significant performance benefits can be realized by using an aerodynamically assisted insertion into an orbit (planetary and low Earth) This maneuver substantially reduces the mission propellant requirements by using the aeroassisted maneuver to significantly reduce a propulsive maneuver Studies have assessed aeroassisted system concepts ranging from simple devices to high L/D winged systems While aeroassisted concepts show performance advantages over all propulsive concepts, launch capabilities, basin techniques (ground or space), and mission requirements (OTV DOD, planetary, etc.) have a strong influence on aeroassisted system concept selection. It is the objective of this RTOP to conduct a multi-year aeroassisted system technology activity that will evaluate generic aeroassisted OTV system concepts leading to a selection of the most promising approach for initial aeroassisted OTV application. This activity then leads to a focused OTV technology readiness program (phase 1) for the initial system that has a target completion in FY-87 A follow-on aeroassisted technology development activity (phase 2) is envisioned that would permit an upgrading to a manned OTV capability Transportation systems technology will be evaluated to focus and analyze technology requirements for advanced transportation systems, Earth launch vehicles, orbit-to-orbit vehicles, etc. The initial phase of the transportation systems technology assessment will extend over a multi-year period

W83-70219

506-63-31

Lyndon B Johnson Space Center, Houston, Tex OEX (ORBITER EXPERIMENTS) PROJECT SUPPORT

J D Harris 713-483-5814

The OEX Program was initiated jointly by JSC and OAST to utilize the space shuttle as a research vehicle. The program objective is to collect data in the technology disciplines that will augment the research and technology base for future spacecraft design. Flight data relative to these disciplines will be collected by utilizing the currently planned TFI/MADS configuration, by modifications and/or augmentations to the orbital flight test baseline instrumentation and by development of unique experiments compatible with the operational capabilities for flight on the orbiter Studies will be conducted to determine the optimum method of utilizing the shuttle system to conduct research and technology. These studies will be augmented by investigations to develop experimental programs that would obtain research and technology data in flight regimes applicable to advanced space transportation systems. The primary goal of these studies is more efficient utilization of the STS capabilities to obtain data required to advance the current state of spacecraft technology This RTOP includes the effort associated with overall project management, project support, experiment development initiation, experiment compatibility assessments, experiment integration activities and integration hardware development initiation. The experiment development effort is the subject of additional RTOP's from the appropriate NASA centers

W83-70220

506-63-32

Langley Research Center, Hampton, Va SHUTTLE ENTRY AIR DATA SYSTEM (SEADS) P M Siemers 804-827-3984 (506-51-13)

The objective is to extend the knowledge of aerodynamic, aerothermodynamics and basic fluid mechanics into flow regimes previously inaccessible to the investigator through extraction of flight data during routine operation of the shuttle orbiter. This knowledge will be applied to verify and increase the reliability of sophisticated computational prediction codes, to develop procedures to extrapolate wind tunnel data to flight conditions, to improve the performance and operational capability of the STS, and to provide a data base for studies of future aeronautical and aerospace vehicles. The design, development calibration, and demonstration of the flush orifice Shuttle Entry Air Data System will be accomplished and through-inhouse (LaRC) analysis and test programs. and contracted studies. A retrofitted instrumented nose cap, incorporating the flush orifice Shuttle Entry Air Data System, will obtain flight data which, when reduced, will produce the required air data parameters for each orbiter flight. These data, in conjunction with inertial data, development flight instrumentation data, and data obtained by specialized instrumentation packages, will be utilized to verify aerodynamics and aerothermodynamics performance as well as resolve many basic fluid mechanic questions

W83-70221

506-63-34

Langley Research Center, Hampton, Va SHUTTLE INFRARED LEESIDE TEMPERATURE SENSING (SILTS) E V Zoby 804-827-2707

The objective is to extend the knowledge of the basic aerothermodynamics of leeside flow fields and heat transfer on large lifting vehicles into flow regimes which are inaccessible to investigations in ground facilities through sensing of leeside surface temperatures during shuttle orbiter entry with an infrared scanner. These data will permit development of improved leeside flow field and heat transfer prediction techniques which are required to reduce considerably the weight and cost of thermal protection systems on the leeside of future space vehicles. This experiment utilizes a highly developed infrared scanner and recording system which will be qualified for the severe ascent environment in a development program at the Langley Research Center. The instrumentation and supporting equipment will be installed in a Langley manufactured engineering test model and tested at the Langley Research Center, the flight structural pod, exclusive of the dome, will be manufactured by the shuttle orbiter contractor, and the experiment will be installed in Orbiter 102 at KSC. The SILTS experiment will be flown on a number of early orbiter flights.

W83-70222

506-63-35

Ames Research Center, Moffett Field, Calif INFRARED IMAGERY OF SHUTTLE H Lum 415-965-6544

(506-51-31)

The purpose of this RTOP is to design, develop, and conduct an experiment to be used in conjunction with the first orbital flights of shuttle. The experiment is part of the Orbiter Experiments program (OEX) and will obtain measurements of surface temperature of the lower and side surfaces of the orbiter by means of remote high resolution infrared imagery. This imagery is obtained on board the C-141 Kuiper Airborne Observatory. The experimental equipment to be developed consists of an acquisition telescope and appropriate servo system, a cryogenically cooled focal plane and detector array, and a data handling and storage system. In addition, the software required to produce an engineering image from the raw experiment data will be developed under this RTOP.

W83-70223

506-63-36

Ames Research Center, Moffett Field, Calif
OEX THERMAL PROTECTION EXPERIMENTS
H K Larson 415-965-5369

(506-53-31 506-51-41)

The overall objective of these experiments is to obtain a better understanding of thermal protection system (TPS) reentry heating effects that may permit TPS cost and weight reductions for shuttle and advanced space transportation systems. Four separate experiments will be flown as test panels or tiles replacing baseline TPS on the shuttle orbiter during orbiter flight tests and operational fights. These experiments will take advantage of the real entry heating environment that cannot be fully simulated in ground facilities to demonstrate advanced TPS materials for possible orbiter retrofit and to investigate TPS heating effects. Temperature data will be obtained with existing and follow-on orbiter instrumentation. Baseline TPS procedures and tooling will be used, and none of the experiments will impact orbiter operations. The experiments will be designed and fabricated by both in-house and contract efforts, and experimental hardware will be provided as Government furnished equipment.

W83-70224

506-63-37

Langley Research Center, Hampton, Va SHUTTLE UPPER ATMOSPHERE MASS SPECTROMETER (SUMS)

R C Blanchard 804-827-3984

(506-51-13)

The primary technological objective is to provide flight data for advances in the prediction of aerodynamic behavior throughout the high-speed flight regime, including the free molecular flow and the transition into hypersonic continuum. This objective will be achieved through shuttle orbiter flight instrumentation, including a shuttle upper atmosphere mass spectrometer (SUMS) The specific objective of the SUMS system is to provide in situ high altitude atmospheric data, primarily neutral atmospheric mass density measurements. A spare Viking flight-qualified mass spectrometer will be modified to provide atmospheric data in the rarefied flow flight regime. These data, coupled with data from other proposed experiment systems, will provide aerodynamic information on a winged entry vehicle in flight regimes heretofore unobtainable and will augment ground-based test facilities. In addition, experiment results on the shuttle will provide a benchmark from which to evaluate additional entry technology research. The design, construction, and system tests of the prototype shuttle upper atmosphere mass spectrometer (SUMS) and the supporting analysis on the SUMS system design and implementation will bring the experiment to the flight readiness

506-63-39

Goddard Space Flight Center, Greenbelt, Md
DYNAMIC, ACOUSTIC AND THERMAL ENVIRONMENTS (DATE)
EXPERIMENT (TRANSPORTATION TECHNOLOGY VERIFICATION--OEX PROGRAM)

William F Bangs 301-344-7669 (506-63-39, 506-53-66, 323-52-42)

The DATE experiment is one of the OAST OEX (orbiter experiments) group of STS flight experiments. The DATE program has two objectives The first is the development and validation of advanced technology for prediction of dynamic, acoustic, and thermal environments and associated payload responses in cargo areas of large reusable space vehicles. The second is providing data for immediate application in payload design and verification activities. The DATE program plans to use environmental data from 7 to 12 early shuttle flights in support of these technology efforts. The early shuttle flights represent an unusual opportunity to obtain the particular types and quantities of data that are suitable for implementing the DATE program, but would not be included in the environmental data normally acquired for operational purposes. By end of FY-82 DATE will have accomplished its partial objectives with experimental data produced from flights STS-1, STS-2, STS-3, and STS-4 In FY-83, the objectives will be to continue integration support of delivered calibrated instrumentation, data analysis, and data distribution for flights of opportunity on STS-5, 6, 7, 8, and 9 Funding resources and programmatic considerations will determine the number of flights (but planning is based on three for FY-83) This program is planned to be a joint funded effort between OAST, USAF, and Office of the Chief

W83-70226

506-63-40

Ames Research Center, Moffett Field, Calif

SPACE SHUTTLE ORBITER FLYING QUALITIES CRITERIA (OEX)

D T Berry 805-258-3311

Experience with high-performance aircraft was used extensively to establish handling qualities and flight control system criteria, specifications, and design guides for the atmospheric flight phases of the space shuttle atmospheric flight phases of the Space Shuttle With the opportunity of test data from the forthcoming orbiter flight test, the adequacy of the existing criteria can be evaluated to provide a sound basis for improvements of the orbiters and to establish validated criteria to support the development of second generation orbiters Pilot comments and ratings will be obtained for essential tasks throughout the reentry and landing phases of the orbiter flight tests. Studies will be initiated to develop suitable criteria, in the event that the present criteria are found to be inadequate. Pilot ratings and comments will be correlated with vehicle characteristics obtained from analysis of stability and control maneuvers obtained during shuttle flight tests.

W83-70227

506-63-42

Lyndon B Johnson Space Center, Houston, Tex OEX-ADVANCED AUTOPILOT
Edward T Kubiak 713-483-3878
(506-63-31)

The objective of the orbiter experiment advanced autopilot experiment is to verify in flight a new and unique autopilot which employs a multi-dimensional phase space rotational and translational control law as an impovement over conventional autopilots which use two dimensional phase plane rotation-only control laws. The advanced autopilot will also employ an optimizing linear jet select algorithm. The new autopilot is principally software which is to be programmed into a shuttle flight computer for the experiment. There its performance can be compared with that of the existing shuttle autopilot.

W83-70228

506-63-43

Langley Research Center, Hampton, Va HIGH RESOLUTION ACCELEROMETER PACKAGE (HIRAP) EXPERIMENT DEVELOPMENT

R C Blanchard 804-827-3984

The primary objective is to provide accurate measurements of low level aerodynamic acceleration along the shuttle orbiter roll, pitch, and yaw axes in the rarefied flow flight regime. This flight data supports advances in the prediction of aerodynamic behavior of winged entry vehicles in the high-speed, low density flight regime, including the free molecular flow and the transition into the hypersonic continuum. An orthogonal triaxial set of linear accelerometers will be mounted on the existing orbiter experiment (OEX) aerodynamic coefficient instrumentation package (ACIP)/PCM mounting shelf. Hardware development and integration aspects are accomplished by NASA-JSC, OEX Project Office under a modification to current ACIP-1 development. Studies under this RTOP will be performed to support the design, development, and calibrations of the high resolution accelerometer package (HiRAP) to achieve experiment objectives. In Addition, data reduction algorithms

will be designed, developed, tested, and applied on mulitple flights of the HiRAP

Platform Systems Research and Technology

W83-70229

506-64-12

Lewis Research Center, Cleveland, Ohio
SPACE STATION PROPULSION REQUIREMENTS
M E Valgora 216-433-5186
(506-60-42, 506-55-22)

The objective of this effort is to define and develop system level technology requirements for chemical and electrical propulsion systems and power for electrical propulsion applicable to space platform systems. These studies will develop a technology and cost data base to assist in guiding decisions on which propulsion technologies have the highest potential. These studies will determine performance requirements, identify system constraints, estimate cost, weight, and size of potential propulsion systems, identify new technology needs, determine benefit/cost ratios, and identify priorities of proposed technology programs.

W83-70230

506-64-13

Langley Research Center, Hampton, Va
TECHNOLOGY SYSTEMS ANALYSIS ACROSS DISCIPLINES FOR
PERMANENTLY ORBITING SPACE STATIONS

L J DeRyder 804-827-3666

The objective of the RTOP is to develop system optimization trades across subsystems to determine the maximum technology improvement for permanently orbiting space station systems. System analyses and interdiscipline interaction sensitivity studies will be performed to define technology drivers and priorities for high leverage discipline technology programs. Multidisciplinary systems analysis/optimization methodology and techniques will be developed which provide for modular evolutionary on-orbit growth with advanced technology to satisfy national needs for improved performance while minimizing life cycle costs. System/ subsystem interface architecture requirements will be investigated to both enable and optimize the evolutionary expansion of functional on-orbit system capability. An analytical capability for performing life cycle/ technology cost benefit assessments will be developed.

W83-70231

506-64-15

Jet Propulsion Laboratory, Pasadena, Calif SPACECRAFT SYSTEM TECHNOLOGY D M Turner 213-354-2436 (506-62-69)

Spacecraft maintenance consists of routine operations and fault protection required to achieve a fully functioning, calibrated spacecraft ready to execute a mission. The objective of this investigation is to conduct analyses, define requirements and develop system concepts leading to autonomous spacecraft maintenance where an important consideration for these new autonomous features is that which reduces the cost of mission operations while maintaining high performance and reliability. Autonomy will be accomplished by development of spacecraft design concepts which utilize a high degree of onboard capability to perform operations. These concepts will allow maintenance of these operations in the presence of faults and reduce dependence on ground supervision. An automated spacecraft will (1) improve man's productivity in space by minimizing his involvement in repetitive tasks, (2) handle complex concurrent operations, (3) perform operations where the response time required is less than the two-way light time, (4) reduce life cycle costs, and (5) allow operations to be performed while out of Earth contact This RTOP also supports the specific objective of determining the requirements for an agency-wide Contamination Data Base Specifically, this effort will determine both the user community (within the agency, DOD, and industry) and their needs for such a data base The approach to be taken in this effort will be to consult both the contamination community and the already established Contamination Working Groups established with the NASA and DOD Also, support to the NASA/AF Interdependency Working Group will be included

W83-70232

506-64-19

Marshall Space Flight Center, Huntsville, Ala PLATFORM SYSTEMS STUDY R E Jewell 205-453-0436

Described herein is a platform systems analysis effort which consists of two tasks. The first task is a systems analysis effort with the objectives of defining the technology required to enhance the capability, reduce the development, and lower the cost of manned and unmanned platform Specifically, the effort is to consist of special emphasis trade analyses which are identified as offering high potential for revealing platform improvements but recognized as too complex and interactive to be

conducted in a survey systems technology analysis addressing a broad range of platforms, subsystems, and payloads. The approach for defining the platform technology is to first identify the maximum benefit areas through conducting the special emphasis trade analyses, and then to identify the technology which must be achieved in these areas to realize the benefits. The second task has the objective of defining and evaluating the automation technology and techniques for a power subsystem to reduce life cycle costs, extend the operational life, and improve system performance. The approach is to use a systems level evaluation for accomplishing these objectives. The third task is a study analysis to assess the use of expert systems to control and manage multifunction/configuration spacecraft in a real time environment. Task three is submitted as an overguideline requirement

W83-70233

506-64-22

Lewis Research Center, Cleveland, Ohio PLATFORM SYSTEMS, OPERATIONS

G R Smolak 216-433-6631

The broad objective of the Cryogenic Fluid Management Program is to provide the research and technology base required to design efficient systems for the management of cyrogenic fluids in the space environment The approach to the Cryogenic Fluid Management Program is broad based ranging from fundamental research to applied technology, and includes both analysis and experimentation. Required experimentation is both ground- and space-based. The program features inter-center involvement with LeRC, MSFC, JSC, and GSFC, there are two program. thrusts, applied system and component technology, and fluid management fundamental research Development of the Cryogenic Fluid Management Facility (CFMF) as a shuttle payload is a required part of the applied system and component technology Additional in-space testing will be required to achieve the fluid management fundamental objectives Fundamental experiments involving two-phase heat and mass transfer will be defined and the hardware developed suitable for conduct within the STS Low gravity experiments in the areas of reorientation, and pool and flow boiling will be designed and fabricated via combined contracted/in-house efforts. The data acquired in space will provide basic understanding of low gravity phenomena and will be utilized to develop advanced technology for propulsion stages, life support, and environmental control systems

W83-70234

506-64-23

Langley Research Center, Hampton, Va TELEOPERATOR AND ROBOTICS SYSTEM ANALYSIS

A J Meintrl, Jr 804-827-2489 (506-54-63, 506-57-23)

The objective of this effort is to develop an integrated systems simulation analysis tool for evaluation of teleoperator and robotic systems capable of remote space operations, and evaluate at the systems level, subsystem and components and identify high leverage areas requiring research to allow development of a telepresence system which outperforms direct human manipulation. An integrated robotic software simulation has been under development. This simulation will be expanded and coupled to a manned control station to allow system level integration and analysis studies of remotely controlled vehicles capable of space operations. The near-term approach will be to implement in the Teleoperator and Robotic Systems Simulation (TRSS) software models representing the Remote Orbital Servicing System (ROSS) concept TRSS will allow systems integration and evaluation of emerging concepts in robotics. The output of the simulation will supply specifications for the design, development, and testing of remote systems

W83-70235

506-64-25

Jet Propulsion Laboratory, Pasadena, Calif.

ADVANCED THERMAL CONTROL TECHNOLOGY FOR CROYO-GENIC PROPELLANT STORAGE

P W Garrison 213-354-3225

(506-60-25)

The objective of this RTOP is to provide the technology for long life, low mass active cooling systems for cryogenic propellant thermal control application Joule Thomson (JT) refrigerators driven by adsorption or absorption compressors can potentially meet these requirements. The Approach consists of assessments to identify attractive compressor designs and optimum operating parameters and experiments to characterize candidate absorber materials and to evaluate compressor/ refrigerator performance

W83-70236

506-64-26

Goddard Space Flight Center, Greenbelt, Md

IN-SPACE FLUID MANAGEMENT TECHNOLOGY - GODDARD SUPPORT

Allan Sherman 301-344-5405

(506-64-26)

This RTOP provides manpower to support the In-Space Fluid Management Program managed by the Lewis Research Center Details of the program are in the Lewis RTOP. The Cryogenics, Propulsion and Fluid Systems Branch will provide technical consultation on the supply tank of the Cryogenic Fluid Management Facility, review facility specifications and design concepts, check analyses, and make suggestions The justification for the program is in the primary RTOP. The involvement of Goddard has been approved in a Memorandum of Agreement signed by the Lewis Research Center and the GSFC directors As part of the technical consultation on the supply tank system of the Cryogenic Fluid Management Facility, all facility specifications and design concepts will be informally reviewed, analyses will be checked, and the final design will be reviewed. Suggestions for modifications or design improvements shall be transmitted in a timely manner to the principal technologist

W83-70237

506-64-27

Lyndon B Johnson Space Center, Houston, Tex

SPACE STATION OPERATIONS

W K Creasy 713-483-2561

The objective of this RTOP effort is to (1) establish system design requirements and operating procedures for docking/berthing maneuvers required for construction, assembly, and satellite servicing tasks, (2) identify component technology needs and systems design drivers through analysis of the projected program requirements, including requirements for minimum disturbance 'soft' docking/berthing, and (3) demonstrate validity of system and component design and operational concepts through full-scale ground tests of development hardware. This will be achieved by developing requirements, performing conceptual design studies, performing parametric trade studies, and developing prototype hardware for proof-of-concept systems ground tests. One additional objective in the area of cryogenic fluid management is to identify and evaluate attractive technical concepts for a liquid hydrogen quantity gauge for zero-gravity use in support of the Lewis Research Center's Cryogenic Fluid Management Facility

W83-70238

506-64-29

Marshall Space Flight Center, Huntsville, Ala TELEOPERATIONS AND CRYOGENIC FLUID MANAGEMENT F W Wagnon 205-453-4623 (906-63-13)

This RTOP includes two areas of activity teleoperations and cryogenic fluid management. In the area of teleoperations, a survey will be done on existing developments in teleoperators, a potential teleoperator mission will be characterized and defined, a comprehensive set of requirements will be developed and assessed for this early mission and an assessment will be performed on the Space Telescope extravehicular activity support functions to determine how these could best be accomplished by a teleoperator controlled from a ground station. In the area of cryogenic fluid management, an anaytical/experimental assessment of the thermodynamic, fluid mechanic, and heat transfer interactions between components and subsystems within a liquid hydrogen management system for orbital propulsion will be performed. A large scale test article will be used in conducting the experimental tests. Results will provide design guidance for OTVS, supporting orbital experiments and normal gravity data for comparison with low gravity results. Technologies involved in the development of reusable cryogenic insulations will be pursued

W83-70239

506-64-31

Ames Research Center, Moffett Field, Calif SPACE STATION LIFE SUPPORT TECHNOLOGY

P D 415-965-5733 Quattrone

(199-60-12, 199-60-22)

The objective of this program is to develop space station crew/life support air revitalization, waste management, and thermal control technology to support the establishment of permanent human presence in space. This program objective includes technology development to support the initial space station and for later space station subsystem retrofits This program is designed to implement the Space Station Steering Committee's Crew and Life Support Working Group recommendations in task 5, task 6 and task 12. The objectives of these tasks are as follows (task 5) to provide extravehicular maneuvering unit (EMU), manned maneuvering unit (MMU), and extravehicular activity (EVA) support equipment technology to quarantee that construction, maintenance and repair of an initially launched space station can be accomplished with safety and facility, (task 6) to secure regenerative life support system technology for a 1990 space station launch, and (task 12) to achieve a technology-ready condition for regenerative life support that provides improved process efficiencies, increased system closure, and additional personal accommodations in contrast to the technology utilized in the initial space station. The specific subsystem technologies in this RTOP include passive thermal control, electrochemical

CO2 concentration, hyperfiltration wash water recovery, static feed water electrolysis O2 generation, and supercritical waste oxidation

W83-70240 506-64-37 Lyndon B Johnson Space Center, Houston, Tex

LIFE SUPPORT SYSTEMS TECHNOLOGY DEVELOPMENT

A F Behrend 713-483-4823

This RTOP is in direct support of the space station development program and reflects the recommendations made by the Crew and Life Support Working Group to the OAST Space Station Technology Steering Committee The objectives are to secure a mature regenerative life support technology base for a 1990 space station launch and to provide backup technology readiness in regenerative life support. These objectives are to be directed at the following life support functions atmospheric revitalization, atmospheric control, and water reclamation

Space Systems Technology Programs Spacecraft Systems Technology

W83-70241

542-03-01

Jet Propulsion Laboratory, Pasadena, Calif
DEVELOPMENT OF A SHUTTLE FLIGHT EXPERIMENT. DROP DYNAMICS MODULE

T G Wang 213-354-6331

The principal objective of this RTOP is to design, fabricate, and test an acoustic positioning and manipulation module for Spacelab and to utilize it to perform the experiment Dynamics of Rotating and Oscillating Drops as part of the NASA Physics and Chemistry in Space Program on an early shuttle spacelab mission, and will be available for Spacelab flights thereafter. This acoustic positioning and manipulation module will allow one to utilize the unique zero-g environment provided by a shuttle/Spacelab flight to perform drop dynamics experiments that are impossible to perform in a gravitational field Examples are (1) study experimentally the problems first proposed by Newton, and never satisfactorily studied, of equilibrium figures and the bifurcation processes of a rotating spheroid, and (2) understand the fission and fusion processes in drops that are also applicable to meteorology. The scope of this work is threefold first, to determine the maximum capability of this facility within the constraints of money and schedule through consultation with the scientific community and investigators, second, to fabricate a flight unit, and third, to perform the perform the experiment Dynamics of Rotating and Oscillating Drops as part of the NASA Physics and Chemistry in Space Program The scientific community will be invited to participate in experiments informally through international symposia and colloquia. Some scientists will participate with JPL as science associates and consultants

W83-70242

542-03-04

Marshall Space Flight Center, Huntsville, Ala

SHUTTLE OPERATIONAL FLIGHT TEST OF A LARGE SOLAR ARRAY

Henry C Hill 205-453-3423 (506-34-19, 506-62-49)

The objective of this RTOP is to provide overall demonstration of the availability of advanced solar array technology by flight testing the Solar Array Flight Experiment as an experiment on shuttle Demonstrating that the array will deploy and retract in space environment and establishing its dynamic characteristics are objective which are particulary important. The approach consists of four basic steps (1) define, through study and analysis, the requirements, criteria, and conceptual design for the solar array experiment system, (2) Perform a detailed design, build, and test the flight array experiment, (3) install and fly the solar array experiment on shuttle, and (4) Evaluate flight results after return to Earth

W83-70243

542-03-14

Langley Research Center, Hampton, Va FILE FLIGHT EXPERIMENTS--ANALYSIS AND SUPPORT W E Sivertson 804-827-3666

(506-18-23, 750-02-23, 506-61-73)

The objective of this RTOP effort is to support future identification and location experiment (FILE) flight experiments and the advancement of feature classification and cloud detection technology Data processing techniques will be developed, evaluated, and used to process and analyze advanced feature classification and cloud detection flight data and imagery Experimental FILE instrumentation parameters will be assessed relative to in situ flight performance. Also, principal investigator participation in FILE I/OSTA-3 and FILE II/LearJet flight operations and data collection will be included. The FILE flight data will be analyzed to evaluate image scene classification relative to vegetation, bare earth, water, clouds, snow, and ice Classification will be based on selected radiance ratios from spectral signature data in the 0.65, 0.85, 1.23, and 155 micron bands. Results from this effort will focus on providing new knowledge required for developed autonomous cloud detection, pointing, and tracking instruments for future missions. In-house FILE image processing techniques will be developed. Existing LaRC computer and color image display systems will be used to analyze data and generate color-enhanced images. Classification algorithms will be developed and in-house statistical evaluations will be conducted to assess performance

W83-70244

542-03-20

Jet Propulsion Laboratory, Pasadena, Calif SPACE CALIBRATION OF SOLAR CELLS

L Sidwell 213-354-5489

(506-55-45)

The objective of this RTOP is to take advantage of the space enviorment of the STS missions to correlate solar cell calibration data with those obtained from a balloon flight. The STS program will provide the opportunity to validate existing calibration procedures and to determine the most cost effective way of accomplishing solar cell calibrations During FY-83, support will be provided to close out any action items resulting from the final design and operation review with MSFC Candidate test solar cells will be selected and installed on th solar cell calibration facility Level 4 integration will be supported at KSC Preintegration and flight readiness reviews will be supported and any action items resulting from these and/or other reviews will be closed out prior to launch (scheduled for April FY-84)

W83-70245

542-03-27

Marshall Space Flight Center, Huntsville, Ala TRIBOLOGICAL EXPERIMENTS IN ZERO GRAVITY

R L Gause 205-453-1500

The experiment, 'Tribological Studies of Fluid Lubricated Journal Bearings in Zero Gravity,' will compare in a zero gravity environment the hydrodynamic films formed in journal bearings by conventional smooth bore bearings versus a 3-lobed bearing design. In addition, the effect of centrifugal loading on these lubrication systems will be investigated The experiment entitled, 'Wetting, Spreading and Operating Characteristics of Bearing Lubricants in a Zero Gravity Environment,' will measure the spreading rates of lubricants in a zero gravity environment and determine the extent to which lubricant wettability is affected by this environment In order to study the tribology of journal bearings in zero gravity, transparent journal bearings will be fabricated for both conventional and experimental designs. Plans call for photography of these bearings operating in zero gravity. The behavioral characteristics of lubricants will be determined by photography of selected-surface combinations and telementered dynamic behavior of the journals

W83-70246

542-03-30

Langley Research Center, Hampton, Va CRYSTAL GROWTH IN SPACE R K Crouch 804-827-3535

(179-80-70)

Objectives of this program are to design and fabricate the necessary hardware and experiment to fly onboard the shuttle in the materials processing in space program and to continue development for scheduled follow-on flights. These experiments, supported by the ground-based studies, will be utilized to provide data on important parameters needed to improve state-of-the-art Earth based growth of compound semiconductor crystals

W83-70247

542-04-13

Langley Research Center, Hampton, Va LOW DURATION EXPOSURE FACILITY Leo P Daspit, Jr 804-827-3704

The broad LDEF project objectives are the following (1) to develop the Long Duration Exposure Facility (LDEF), (2) to develop and perform a first set of experiments on the LDEF, and (3) to broaden the operational STS user community. The LDEF, a shuttle transported, reusable, unmanned, low cost free flying structure on which many different experiments can be mounted, will be developed and manufactured in-house at Langley The experiments, many of which are completely passive with active data measurements being made in the laboratory after recovery, will be solicited from all NASA ceners, other government agencies, industry, and foreign countries. The STS user community will be broadened by the LDEF providing a unique, simple, low cost approach to perform large numbers of needed long duration technology and science experiments. The establishment of a continuing program to provide for LDEF reflights after the first LDEF mission with the operational STS is a part of this RTOP. The implementation of the established follow-on program is not

W83-70248

542-05-12

Lewis Research Center, Cleveland, Ohio FLIGHT TEST OF AN ION AUXILIARY PROPULSION SYSTEM (IAPS)

James F DePauw 216-433-6119

A major of the OAST-LeRC electric propulsion effort is to achieve technology readiness and user acceptance of a high performance, long life mercury ion auxiliary propulsion system for use in the 1980's Accomplishment of this goal depends on attaining the following objectives conduct a flight test of a mercury ion auxiliary propulsion system, provide engineering information on the system performance and system intefaces with the spacecraft, and involve potential users in program activities. The approach is to conduct a space flight test on an ion auxiliary propulsion system oprated for time duration and duty cycle representative of potential operational missions. The flight system uses two 8-cm diameter mercury ion thrusters operating at one millipound thrust level. The experiment will be flown aboard AF Space Test Project spacecraft. The program also includes a ground test program to provide data on system performance and interfaces and a principal investigator function to technically guide the program and interact with potential users.

OFFICE OF SPACE SCIENCE AND APPLICATIONS

Environmental Observation Applied Research and Data Analysis

W83-70249

146-10-04

Ames Research Center, Moffett Field, Calif
CLIMATE MODELING WITH EMPHASIS ON AEROSOLS

J B Pollack 415-965-5530

A coordinated set of theoretical, laboratory, and field investigations of the chemistry and radiative properties of natural (e.g., volcanic) and man made atmospheric aerosol particles are conducted in order to assess their impact on regional and global climate. The field investigitions are intended to provide complementary information on aerosols to that being obtained from spacecraft platforms (e.g., SAM II and SAGE) so as to insure that a comprehensive set of aerosol properties are gathered for climate analyses. The theoretical and laboratory tasks are directed at interpreting and utilizing the aerosol data sets to perform the desired climate assessments. The centerpiece of the field investigations is a set of coordinated aerosol measurements, which are flown together on an appropriate aircraft platform (e.g., U-2) When possible, these flights are conducted in conjunction with spacecraft and other airborne aerosol measurements. Information is obtained on both the aerosol formation mechanisms and on their radiative properties so as to enable the development of a predictive capability as well as a determination of the present climatic effect of aerosols. Both theoretical modeling and laboratory studies are used to further define the mechanisms of aerosol formation, to provide hypotheses that can be tested by the field investigations, and to provide ultimately the predictive tools. Theoretical investigations involving radiative transfer, dynamics, and aerosol formation are utilized for making the climatic assessments

W83-70250

146-20-10

Ames Research Center, Moffett Field, Calif TROPOSPHERIC AIR QUALITY - TECHNOLOGY DEVELOPMENT Boris Ragent 415-965-5404 (146-10-04, 147-10-03)

The broad research objective is to characterize tropospheric chemistry with a view toward determining impacts on the many aspects of environmental quality relevant to human health, agriculture, climate, and weather Present emphasis of this RTOP is to develop the needed airborne instrumentation systems capable of measuring the important tropospheric trace species such as OH, sulfur oxides, nitrogen oxides, CO, and aerosols For proper interpretation of field measurements all relevant meteorological parameters must also be well characterized Program goals are described in NASA RP 1062. The plan is to first provide technology development of the needed instrumentation before performing extended field measurements. Developments for both low-altitude and medium-altitude (upper troposphere) aircraft will be stressed.

W83-70251

146-60-00

Goddard Space Flight Center, Greenbelt, Md

METEOROLOGICAL SATELLITE DATA RESEARCH

Ernest A Neil 301-344-6291

The objective of this research is to exploit satellite observations of the atmosphere to initialize, verify and improve models, diagnose atmospheric processes, assess the impact of satellite data on forecast accuracy, and to increase understanding of atmospheric behavior. The genesis, development, maturation and decay of organized large-scale weather systems will be studied and numerical experiments will be conducted to assess the usefulness of satellite observing systems. The performance of various predictive models will be assessed and the resolution and realism of general circulation models will be improved Expected results include more realistic model parameterizations, improved analysis techniques, diagnostic studies, model skill evaluations, and improved forecast models.

W83-70252

146-61-00

Marshall Space Flight Center, Huntsville, Ala METEOROLOGICAL SATELLITE DATA RESEARCH AND APPLICATIONS

W W Vaughan 205-453-3100

The objective of this research is to contribute to the NASA Global Weather Research program objectives by performing diagnostic and theoretical studies of global-scale atmospheric systems to (1) develop new and improved spaceborne atmospheric sensing techniques. (2) develop new techniques to extract information from and more fully utilize existing and planned spaceborne atmospheric sensing systems, and (3) contribute to the development of understanding of global weather processes. Detailed diagnostic studies will be conducted with satellite and ground-based data sets, guided by theoretical studies to understand the role of latent heat release, in the dynamics of cyclones. Global weather processes will be examined to gain improved understanding of the scales of motion and to develop techniques for including satellite data in diagnostic procedures.

W83-70253

146-64-00

Goddard Space Flight Center, Greenbelt, Md
GLOBAL WEATHER EXPERIMENT DATA PROCESSING AND
RESEARCH

Ernest A Neil 301-344-6291

The objective of this RTOP is to support research investigations by the Academic community and NASA investigators utilizing the FGGE data base, provide advanced computational techniques and equipment to support such research, and investigate new data sources for incorporation into global circulation models. In addition, it is intended to continue support of outside investigator's proposals for research utilizing the FGGE data base through Peer Review of submitted proposals, continue operating of the modeling and simulation computer facility in support of university and in-house atmospheric research efforts, procure, check out and operate a new high speed vector processor in support of university and NASA atmospheric research programs, investigate new and novel data processing techniques and advanced data sources for applicability to global circulation models. Also, continued research support to the academic community and check out, programming and operation of a HSVP computational facility in support of NASA's atmospheric research program is planned

W83-70254

146-65-00

Goddard Space Flight Center, Greenbelt, Md METEOROLOGICAL PARAMETER EXTRACTION

Ernest A Neil 301-344-6291

The objective of this RTOP is to develop new and improved techniques for retrieving useful parameters from satellite-measured radiances and to interpret these retrievals to provide information on the state and motion of the atmosphere Investigations and case studies are planned to develop interpretative information and establish relationships between satellite radiances and atmospheric processes and to develop advanced algorithms to perform the required transformations. Research in methods to determine temperature, moisture, wind and precipitation from measurements of various portions of the electromagnetic spectrum is proposed. Other objectives include methods and techniques to improve the accuracy and resolution of satellite measured radiance data to improve the accuracy and utility of such data and to develop new techniques to provide additional physical parameters from radiance data and establish the limits of radiance data accuracy achievable by satellite means.

W83-70255

146-66-01

Jet Propulsion Laboratory, Pasadena, Calif NUMERICAL ANALYSIS OF REMOTE SENSING DATA M T Chahine 213-354-2433

The main objective of the proposed investigation is to develop rapid retrieval algorithms for accurate interpretation of remote sounding radiance data measured by the various NASA and NOAA weather satellites The components of the retrieval algorithms will consist of individual numerical methods dealing with (1) application of analytical techniques to separate the effects of clouds from the radiance data measured in the pressure of partial cloud covers (2) development of a three dimensional quality control approach to filter out spurious temperature profiles. (3) adaptation of the resulting temperature profiles to the requirements of the GLAS-GCM to demonstrate the impact of remote sounding data on weather forecasting, (4) retrieval of accurate sea surface temperature using the 3.7 micron window, (5) derivation of three dimensional global maps of the distribution of the amounts and heights of clouds, (6) improving the accuracy of computed atmospheric transmission functions needed for interpretations, using spectral data measured by the JPL High Speed Interferometers, and (7) investigating a new approach to derive air-sea surface temperature differences at the surface, using data from the HIRS II instrument

W83-70256 146-70-00 Goddard Space Flight Center, Greenbelt, Md

METEOROLOGICAL OBSERVING SYSTEM DEVELOPMENT S H Melfi 301-344-6348

The objective of the proposed investigation is to develop new and improved spaceborne remote sensing systems in support of the NASA Global Weather Program and to develop improved data processing and retrieval techniques to provide for more accurate understanding of processes which influence the state and behavior of the atmosphere Theory, laboratory measurements, and field experiments will be used to define, develop, and evaluate new and improved remote sensing techniques to observe profiles of atmospheric temperature, moisture, and pressure, precipitation, surface properties, and atmospheric radiative properties Infrared visible and microwave, and passive modes will be studied Evaluation, in cooperation with other scientists, will be performed to assess improvement in weather forecasting. Expected results include improved techniques and instrumentation to observe profiles of atmospheric temperature, moisture, and pressure as well as precipitation, surface properties, and atmospheric radiative properties leading to improved weather prediction

W83-70257 146-71-00

Goddard Space Flight Center, Greenbelt, Md

VERIFICATION AND ANALYSIS OF SATELLITE DERIVED PRODUCTS

F J Schmidlin 804-824-3411

The objectives are to (1) provide meteorological rawinsonde and rocketsonde measurements for comparison, verification, and calibration of the Operation Environmental Satellite Instruments (i.e., NOAA-7), (2) using data from Wallops and other rocketsonde sites compare, analyze, and interpret the measurements, including assessing the reliability and precision of the in situ instruments, (3) demonstrate methods to enhance the applicability of TOVS data, and (4) provide meteorological rocketsonde data in support of space shuttle reentry analysis. Unique rawinsonde and rocketsonde measurements obtained at WFC between 1980 to 1983 during satellite overpass are to be used as a control on comparisons of in situ satellite data obtained at the MRN rocketsonde sites Argentina, Brazil Norway, Sweden and USSR data will provide additional data covering wider geographic distribution. Statistical analysis of the measurement pairs will continue with a report expected early in FY-83 Data obtained during the 30 day series launched in FY-83 will be analyzed to demonstrate the applicability of satellite data Expected results are new and/or additional information on the precision of the rawinsonde and rocketsonde, a better understanding of the influence of atmospheric space/time variability on satellite data verification, new knowledge on the reliability and accuracy of retrieved temperature data from satellites, recommendations to enhance the utilization of the satellite

W83-70258 146-72-01

Jet Propulsion Laboratory Pasadena, Calif GLOBAL WEATHER RESEARCH - MICROWAVE PRESSURE SOUNDER

D A Flower 213-354-4151

This RTOP supports the second phase of the MPS research program, the objective of which is to develop an instrument for the remote measurement of atmospheric pressure at the Earth's surface Surface pressure is an important meteorological parameter but no method at present exists for its remote measurement. Extensive design studies have shown that differential absorption measurements in the wings of the 60 GHz oxygen absorption band are potentially capable of providing surface pressure observations with the accuracy and coverage suited to applications in global weather research and operational weather

forecasting. The specific objectives of this phase of the investigation are verification of the pressure measuring concept, characterization of the performance of an aircraft version of the MPS, a satellite instrument definition study, and the advanced developed of critical components. The approach will be to use the results from a series of CV-990 test flights with the MPS aircraft instrument, to verify theoretical relationships between the measured millimeter-wave absorption of the atmosphere and its meteorological parameters. This series of CV-990 test flights in a range of atmospheric types will be used to fully characterize the performance of the MPS instrumentation. Results from these experiments will be applied to previously developed optimization procedures for selecting the operating frequencies of a satellite MPS. A hardware design of this instrument will be produced together with flight experiment plans for testing, spacecraft integration, data analysis, management and cost A special study of the antenna design will be undertaken. Development work will be initiated on the combination of IMPATT diodes in a single device to provide millimeter-wave oscillators with an output power of about 2W

W83-70259 146-72-02

Jet Propulsion Laboratory, Pasadena, Calif GLOBAL WEATHER RESEARCH - ADVANCED MOISTURE AND TEMPERATURE SOUNDER (AMTS) M T Chahine 213-354-2433

The ultimate objective of this effort is to develop an infrared advanced moisture and temperature sounder (AMTS) which meets the requirements of the numerical weather prediction models of the late 1980's These models require global atmospheric temperature profiles with an accuracy of 1K and with a vertical resolution comparable to that of radiosondes. This accuracy and vertical resolution requirement, which is not satisfied by current sounders, is achievable with the AMTS concept by careful choice of narrow band infrared channels utilizing the dependence of the absorption coefficients on pressure and temperature Improvements in the vertical resolution of tropospheric temperture profiles to meet numerical weather prediction requirements are obtained from measurements with a resolution of 2 cm(-1) in high J-lines of the R-branch of the 4.3 microns CO2 band. A complementary set of 15 microns channels with a spectral resolution of 0.5 cm(-1) is used to sound the upper troposphere and stratosphere Elimination of the effects of clouds is accomplished by taking simultaneous measurements in the 4.3 and 15 microns bands. During the past years we have developed designs for a stand-alone AMTS for a low earth orbiter (LEO) During FY-82 we continued the development of the AMTS by evaluating the performance of a combined infrared/microwave sounder system for a LEO In parallel with this we continued the evaluation of the magnitude of various random and systematic errors in the radiometry of the baseline design. During FY-83 we propose to concentrate our effort on an AMTS system study, that is the interaction between hardware capability, end user need and ground data processing, envisioned by the user or necessitated by hardware or mission constraints

W83-70260 146-72-04

Jet Propulsion Laboratory, Pasadena, Calif
TROPOSPHERIC WIND MEASUREMENT ASSESSMENT
E D Hinkley 213-354-3555

The objective of this program is to evaluate certain aspects of an active laser technique for global measurement of tropospheric wind fields This technique, based on long range Doppler lidar using pulsed lasers, has the potential for providing global wind data from an orbiting platform Several types of remote measurements of atmospheric wind velocities have been analyzed, e.g., passive microwave, millimeter wave, infrared radiometry, and active visible and infrared range-gated lidar, with the results indicating that the technique (using CO2 lasers or others with similar characteristics), was the superior technique for tropospheric wind field measurements During FY-83, the work will continue on an experimental study of vertical profiles of atmospheric aerosol backscatter at various CO2 laser wavelengths in the 9 to 11 micron region. This study will be conducted using an existing TEA CO2 lidar facility, employing a single longitudinal mode injection-controlled TEA laser transmitter and a heterodyne receiver. The mini-TEA laser will be used in a ring laser configuration to study its properties when injection locking is employed, and design of an interface between this laser and the airborne MSFC system will be performed in preparation for future collaborative measurements

W83-70261 146-72-05

Jet Propulsion Laboratory, Pasadena, Calif
ADVANCED MICROWAVE SENSING OF METEOROLOGICAL
PARAMETERS

R K Kakar 213-354-7748

The objective of the proposed research is to specify a future operational microwave sounder (FOMS) system that will serve as a

successor to the currently operational microwave sounding unit. The primary objective for the FOMS system will be to provide global data on temperature and water vapor profiles for synoptic weather forecasting. In addition, precipitation intensity and distribution, integrated water content and cloud liquid water will also be measured. The previously proposed advanced microwave sounding unit (AMSU) will serve as a baseline for the specification of FOMS. Theoretical and experimental studies will be performed to optimize the capability of the FOMS system. The necessary measurement program will be carried out with the suitably modified airborne advanced microwave moisture sounder developed by the Georgia Institute of Technology.

W83-70262 146-73-00

Marshall Space Flight Center, Huntsville, Ala METEOROLOGICAL OBSERVING SYSTEM DEVELOPMENT R G Eudy 205-453-0514

The objective of this research is to contribute to the NASA Global Weather Research program by performing fundamental studies aimed at improving our ability to measure synoptic-scale atmospheric wind flow on a global basis. Utilizing the talents of university and private contractor groups plus the MSFC in-house talents and laboratory capabilities, specific research activities as described in the tasks of this RTOP will be accomplished.

W83-70263

146-74-01

Langley Research Center, Hampton, Va
METEOROLOGICAL LIDAR DEVELOPMENT
F V Browell 804-827-2576

The objective of this RTOP is to developed lidar techniques for remote measurements of water vapor profiles in the lower atmosphere. This research program will have as its main emphasis the investigation of near-IR DIAL techniques for airborne/space-borne water vapor profiling. The airborne differential absorption lidar (DIAL) system will be modified for application to water vapor DIAL measurements in the 940 nm wavelength region. Performance of an Alexandrite laser versus a Nd YAG-pumped dye laser will be evaluated for measurement of water vapor profiles. Techniques will be investigated for the generation of laser output near 1140 nm for DIAL measurements of water vapor simulations will be conducted to evaluate the DIAL measurements of water vapor in the 720, 940, and 1140 nm wavelength regions from airborne and spaceborne platforms.

W83-70264 146-76-00

Marshall Space Flight Center, Huntsville, Ala STUDIES OF DYNAMICS OF ATMOSPHERIC FLOWS W W Vaughan 205-453-3100

The objective of this RTOP is to contribute to the NASA Global Weather Research program by performing fundamental studies aimed at improving our understanding of large scale atmospheric dynamics Studies applicable to the scientific design and interpretation of spherical laboratory models of large scale geophysical flows will be conducted These spherical models must be operated in a low gravity environment since the radial dielectric body force used to simulate gravity is weak Two models are being prepared for Spacelab flights. The geophysical fluid flow cell (GFFC) is concerned with convective instability in vertically unstable atmospheres, and the atmospheric general circulation experiment (AGCE) is concerned with baroclinic instability in vertically stable atmospheres.

Upper Atmospheric Research Program

/83-70265 147-10-03

Ames Research Center, Moffett Field, Calif **ATMOSPHERIC PROCESSES, EXPERIMENTS AND SYSTEMS** Boris Ragent 415-965-5404 (146-10-04, 146-20-10)

The research objectives are to perform studies of stratospheric transport, and tropospheric stratospheric exchange processes, and to obtain benchmark data on important atmospheric species Observational data from balloon, aircraft, and satellite instrumentation are utilized Measurements are made of the meteorological field parameters, winds, temperature, pressure and atmospheric tracer species such as CFMS, N2O, water vapor, O3, CO, and aerosols Coordinated simultaneous measurement sets are emphasized. The current interest is stratospheric water vapor transport and wave vapor budget. The approach is to form experiment working groups composed of experiment principal investigators and additional experts in atmospheric processes. Workshops are then held, appropriate experiments are designed to study important processes some new instrumentation is developed as appropriate, cooperative experiments are conducted, and the results are subsequently analyzed,

and published Typical experiment platforms are NASA's U-2, ER-2, and CV-990 aircraft

W83-70266 147-11-00

Goddard Space Flight Center, Greenbelt, Md

UPPER ATMOSPHERE RESEARCH - FIELD MEASUREMENTS

William S Heaps 301-344-5106

The objective of this RTOP is to determine specific local chemical and physical interactions in the atmosphere using coordinated in-situ measurement campaigns from balloon platforms, specifically with respect to the OH radical, and related species. This will be accomplished through the development of a balloon-borne lidar system for the measurement of trace species, especially OH and ozone and the direct measurement of photolysis rates of importance in the atmosphere. The research will result in the determination of absolute concentration measurements of key trace species and validation of the photochemical models.

W83-70267 147-11-04

Jet Propulsion Laboratory, Pasadena, Calif STRATOSPHERIC RESEARCH, BALLOON LASER IN-SITU SENSOR

R T Menzies 213-354-3787

The primary objective of the balloon laser in-situ sensor task is to obtain reliable data on the concentrations and distributions of the minor and trace species in the stratosphere. These data are to be used by modelers and dynamicists to assess and predict the effects of change in the chemical contents of the stratosphere due to man's activities. This instrument uses tunable infrared diode lasers to measure absorption due to selected species between a balloon gondola and a lowered retroreflector. An optical tracking system stabilizes the laser beam on the retroreflector. Several species can be measured in this manner, throughout a diurnal cycle.

W83-70268 147-11-05

Lyndon B Johnson Space Center, Houston, Tex
IN-SITU MEASUREMENTS OF STRATOSPHERIC OZONE

D E Robbins 713-483-5039

The objective of this research is to measure ozone in-situ from multisensor balloon-borne platforms to participate in coordinated studies to validate photochemical models of stratospheric ozone, and to intercompare results with those from other techniques. Ozone measurements will be made using an existing instruments as a piggybacies experiment on platforms carrying experiments measuring other species of interest to stratospheric ozone chemistry. The ozone instrument is a modified Dasibi which pulls air through an enclosed cell where the ozone mixing ratio is measured by UV photometry.

W83-70269 147-12-00
Goddard Space Flight Center, Greenbelt, Md
UPPER ATMOSPHERE RESEARCH - FIELD MEASUREMENTS

J E Mentall 301-344-8959

The objectives of this research are to (1) determine the specific local chemical and physical interactions in the atmosphere by a combination of theoretical studies and coordinated in situ measurement campaigns from rocket and balloon platforms, (2) investigate the variations and perturbations of the chemical and physical state of the atmosphere, ie, variations with altitude, solar conditions, season, latitude, and perturbations from volcanoes, tropical storms, industrial and agricultural activity, and (3) develop and calibrate selected instruments for local and remote investigations of the atmosphere. The approach will be to (1) develop a balloon-borne Michelson interferometer to measure the concentrations and diurnal variations of trace stratospheric species, (2) develop a pointed spectrometer system to measure the solar photon flux within the stratosphere, and (3) perform multiinstrument, coordinated measurements on minor species in the stratosphere. One dimensional photochemical models to compare experimental results with theoretical predictions will be developed. The research will result in the improvement and validation of photochemical models, improvement of understanding of upper atmosphere dynamics and transport, and the determination of in situ solar flux and the accuracy of radiative transfer calculations

W83-70270 147-12-05

Jet Propulsion Laboratory, Pasadena, Calif
STRATOSPHERIC FOURIER SPECTROSCOPY AT NEAR AND MID
IR WAVELENGTHS

C B Farmer 213-354-2039

The primary objective of this task is to obtain reliable data on the concentration and distribution of minor and trace species in the Earth's upper atmosphere. These data are provided for use by modelers and dynamicists to assess and predict the effects of changes in the chemical contents of the stratosphere due to man's activities. The emphasis of

this task is placed on the simultaneous determination of profiles of a large number of related families of photochemical species with sufficient accuracy to permit seasonal variations to be detected. Compositional data are determined from infrared absorption spectra in the 2.5 to 16 micron region at a resolution of 0.01 cm(-1) obtained by observing the Sun through long stratospheric paths at sunset or sunrise from high altitude balloons. The instrument is a continuous scan Michelson interferometer which can obtain data in 80 second time intervals, fast enough to result in a vertical height discrimination of better than 2 km. The instrument's throughput is such as to produce spectra which have signal to noise ratios in excess of 200.1 througout

W83-70271

147-12-06

Jet Propulsion Laboratory, Pasadena, Calif STRATOSPHERIC RESEARCH, FIELD MEASUREMENTS PRO-GRAM MILLIMETER AND SUBMILLIMETER RADIOMETRY

J W Water 213-354-3025

The objective of this program is to improve understanding of Earth's upper atmosphere by microwave measurement techniques at millimeter and submillimeter wavelengths. Well founded concerns that man's technological activities may perturb upper atmospheric balances, particularly those maintaining stratospheric ozone, justify this objective The approach is to first determine which measurements are needed for atmospheric research and perform calculations to define which subset of these can be usefully performed by microwave techniques. A field program is then established for those measurements of sufficient use The field program may involve instrument development or improvement One important goal of this program is to determine both the capabilities and limitations of microwave techniques so they can be used efficiently in NASA's overall upper atmosphere research program. The plan of this research program for the current year is to use the existing JPL balloon microwave limb sounder (BMLS) in a NASA-coordinated measurement program to improve understanding of how chlorine from industrial sources might deplete stratospheric ozone The BMLS operates simultaneously in three spectral bands near 205 GHz to measure thermal emission from ClO, O3, and tentatively, H2O2

W83-70272
Jet Propulsion Laboratory, Pasadena, Calif
PRESSURE MODULATOR RADIOMETER

H K Roscoe 213-354-3025

The Oxford balloon-borne pressure modulator radiometer (BPMR) vertical profiles of minor stratospheric constituents by sensing thermal emission from the atmospheric limb Its current capability includes measurements of NO and NO2, where sensitivity and selectivity are incrased by means of pressure modulators, and of HNO3, CINO3 and N2O5, where a novel selective filter removes interfering signals from CH4 and N2O Objectives in 1980 and 1981 were to measure these constituents for as much of the day-night cycle as possible, and to compare the results with other instruments making simultaneous measurements. A further objective was to measure in the laboratory the response of the radiometer to each constituent over a wider range of pressures and temperatures tha hitherto, and to remeasure the response to interfering CH4 and N2O In spring 1981 BPMR flew on a gondola with the National Physical Laboratory's cooled grating spectrometer Excellent NO and NO2 ata were received from mid-day until the flight termination at 2 am Unsatisfactory procedures in the data analysis programs have prevented the retrieval of profiles as yet, the rapid changes in both NO and NO2 radiances near sunset can be clearly seen. For the first time, the slower change in radiance at N2O5 wavelengths was observed If interpreted as due to N2O5, the profile deduced from this signal and the time constant of the night-time increase agree remarkably with model predictions

W83-70273

147-15-00

147-12-08

Goddard Space Flight Center, Greenbelt, Md SOLAR FLUX IN UPPER ATMOSPHERE

J E Mentall 301-344-8959

The objective of this RTOP is to determine the transmission of the Earth's atmosphere in the molecular oxygen Schumann-Runge bands. Using a spectrometer pointed at Sun from a high altitude parachute, the transmitted photo flux in the wavelength region 180 to 300 nm is measured as a function of altitude. The transmitted photon flux is compared with the predicted flux using absorption cross sections measured in the laboratory. This comparison provides a sensitive test of the accuracy of the absorption cross sections when the optical depth is greater than one.

W83-70274

147-16-01

Jet Propulsion Laboratory, Pasadena, Calif MULTI-SENSOR BALLOON MEASUREMENTS

W T Huntress 213-354-8275

(147-12-05, 147-12-06, 147-12-08)

A continuing series of stratospheric balloon flights is conducted to measure the abundance and altitude distribution of key chemical constituents in the upper atmosphere. A modular gondola system is used to carry a multiinstrumented package consisting of several JPL remote sensing instruments, or instruments from other institutions in the U.S. and abroad, configured for a particular scientific purpose for any one flight. Data are obtained on the altitude profiles for a number of chemically coupled species all at the same time and in the same air mass for instrument intercomparison purposes and for the validation of atmospheric chemical models.

W83-70275

147-18-02

Jet Propulsion Laboratory, Pasadena, Calif GAS CORRELATION WIND SENSOR

D J McCleese 213-354-2317

The objective of this task is the development of a measurement technique for remote sensing of stratospheric and mesospheric winds from spacecraft. The approach is through the continued laboratory development and test of a gas correlation spectroradiometer. This instrument measures the wind induced Doppler shift in atmospheric thermal emission spectra of selected molecular species (e.g. N2O and CO2). Previous numerical and laboratory studies of this technique conducted at JPL indicate that wind measurements can be made in the 20 to 120 km altitude interval with an accuracy of better than 5 m/s. The gas correlation wind sensor is also capable of making simultaneous measurements of atmospheric temperature and trace species abundance profiles in the upper atmosphere. These capabilities will also be developed in the laboratory.

W83-70276

147-20-03

Ames Research Center, Moffett Field, Calif
QUANTITATIVE INFRARED SPECTROSCOPY OF MINOR
CONSTITUENTS OF THE EARTH'S STRATOSPHERE

Charles Chackerian, Jr 415-965-5510

Remote detection and measurement of stratospheric species via spectroscopic techniques is being routinely employed to develop a better understanding of this portion of our atmosphere and man's effect upon it Proper interpretation of these measurements relies strongly on having the correct laboratory data. The objective of this work is to obtain laboratory measurements of basic molecular parameters, such as rotational line intensities and half-widths, absorption band intensities, vibrational and rotational constants, vibration-rotation interaction constants, line position measurements including pressure induced shifts, and Franck-Condon factors. The determination of these parameters, and their dependence on pressure and temperature, will be obtained by using long path gas cells, cooled and heated cells, and high resolution interferometers and spectrometers.

W83-70277

147-21-00

Goddard Space Flight Center, Greenbelt, Md

UPPER ATMOSPHERE RESEARCH - REACTION RATE MEASUREMENTS

L J Stief 301-344-7529

The objective of this RTOP is to measure chemical kinetic rate coefficients of importance to the stratosphere and mesosphere. The laboratory effort in chemical kinetics uses existing equipment of unique capability for the purpose of measuring absolute rate constants of reactions of importance in current models of the stratosphere. Rate constants of atom-molecular and radical molecule reactions are measured as a function of temperature and pressure and under conditions in which the number of atoms or radicals is much less than the number of molecules A new research direction will be investigated, namely radical-atom and radical-radical reactions of novel species whose reactivities as yet are virtually unknown. This new direction will necessitate the acquisition of a mass spectrometer system for incorporation into out discharge flow apparatus. Addition of mass spectrometry for detection, monitoring, and direct analysis of reaction products (coupled with our current approach of following reactants) will add a new dimension to our capability. This will allow us to determine reaction channels and provide direct evidence for elucidation of reaction mechanisms

W83-70278

147-21-03

Jet Propulsion Laboratory, Pasadena, Calif
CHEMICAL KINETICS OF THE UPPER ATMOSPHERE
W B DeMore 213-354-2436

The objectives of this research are to obtain direct measurements of rate constants and temperature dependences for reactions of HO(x).

NO(x), CIO(x), BrO(x), and FO(x) in stratospheric chemistry, and to develop techniques for laboratory study of relevant transient species

W83-70279

147-22-01

Jet Propulsion Laboratory, Pasadena, Calif.

PHOTOCHEMISTRY OF THE UPPER ATMOSPHERE W B DeMore 213-354-2436

The objective is to conduct laboratory studies of stratospheric photochemistry, including absorption cross sections, photolytic quantum yields, reaction mechanisms, and product distributions

W83-70280

147-23-00

Goddard Space Flight Center, Greenbelt, Md

UPPER ATMOSPHERE RESEARCH - LABORATORY MEASURE-**MENTS**

T J McGee 301-344-5645

The tasks of this research are (1) to support ongoing lidar experiments, (2) to perform laboratory studies to test the feasibility of measurements of additional species (3) to test and calibrate new instruments, and (4) measurement of UV absorption cross sections of importance in atmospheric photochemistry. The approach will be to measure spectroscopic parameters of importance atmospheric constituents in all regions of the spectrum from the VUV to submillimeter waves Studies will be performed in both absorption and emission Quantitative spectroscopic data will be measured for a more accurate interpretation of current field experiments and to demonstrate the feasibility of new field measurements

Jet Propulsion Laboratory, Pasadena, Calif. INFRARED LABORATORY SPECTROSCOPY IN SUPPORT OF STRATOSPHERIC MEASUREMENTS

R A Toth 213-354-2140

The program involves the acquisition and analysis of molecular spectral parameters which are required for the interpretation of data from stratospheric measurements. The laboratory spectral measurements will be conducted specifically in support of the JPL infrared interferometers. These instruments have requirements relative to spectral region of operation, spectral resolution, and molecules for which it is best suited Emphasis is placed on accuracy of line frequency, line width, and line strength measurements, in order to take full advantage of spectroscopic techniques for quantitative atmospheric species measurements. A large portion of the spectral data will also be of value to other groups who use spectroscopic instruments for atmospheric measurements

147-23-09

Jet Propulsion Laboratory, Pasadena, Calif LASER LABORATORY SPECTROSCOPY

J S Margolis 213-354-3616

The program involves the acquisition and analysis of molecular spectral parameters which are required for the interpretation of data from laser stratospheric measurements. Specifically the type of laser stratospheric instruments supported are the LHR and the balloon laser in-situ sensor. The spectral parameters measured are line positions, absorption strength and air broadening

W83-70283

147-23-10

Jet Propulsion Laboratory, Pasadena, Calif

MILLIMETER/SUBMILLIMETER LABORATORY SPECTROSCOPY E A Cohen 213-354-4701

A program of laboratory studies related to stratospheric research will be conducted in millimeter and submillimeter spectroscopy. The program involves the acquisition and analysis of molecular spectral parameters which are required for the interpretation of data from stratospheric measurements. The laboratory spectral measurements will be conducted specifically in support of the JPL millimeter radiometer instruments. Emphasis is placed on accuracy of line frequency, line width, and transition movement measurements, in order to take full advantage of spectroscopic techniques for quantitative atmospheric species measurements. A large portion of the spectral data will also be of value to other groups who use spectroscopic instruments for atmospheric measurements

W83-70284

147-30-02

Ames Research Center, Moffett Field, Calif STRATOSPHERIC RESEARCH

E F Danielsen 415-965-5527

(147-20-03, 146-10-04)

The objective of this research is to increase our understanding of the dynamics, thermodynamics and composition of the Earth's stratosphere and mesosphere with emphasis on atmospheric transport and its effects on the distributions of energy, momentum and trace constituents, such as water vapor, ozone, etc. The research includes development of numerical, predictive and diagnostic models in three dimensions. The predictive, spectral model, being developed at Ames, is sufficiently general to permit analysis of the effects on the stratosphere of waves generated in the troposphere by baroclinic instability or surface topography. An much simpler model of the middle atmosphere developed at the University of Washington emphasizes low wave number interactions in the stratosphere and mesosphere. The diagnostic models being developed at San Jose State and Ames will be applied both to actual atmospheric observations and to predictions made by the NOAA-GFDL general circulation model From both data sets, vertical as well as horizontal velocities will be derived and analyzed statistically for transport parameterizations in 2-dimensional models. Complementary to these large scale studies, radiosonde and U-2 measurements from experiments conducted in the tropics are being analyzed for mesoscale transpots and tropospheric-stratospheric exchange in the tropics. Ab initio computations of molecular processes important to stratospheric photochemistry are also being carried out

W83-70285

Goddard Space Flight Center, Greenbelt, Md UPPER ATMOSPHERE RESEARCH - THEORETICAL STUDIES R S Stolarski 301-344-5485

This research will (1) provide the framework for developing and understanding an organized, solid body of knowledge of the physics, chemistry, and dynamics of the Earth's upper atmosphere, (2) analyze data from upper atmospheric flight programs, and (3) predict and assess the effects of natural and man related perturbations on the atmosphere The approach will be to (1) continue to develop and utilize a hierarchy of models of upper atmospheric photochemistry and radiation ranging from simplified models to the incorporation of chemistry into a global general circulation model, and (2) utilize field measurement data to elucidate the controlling mechanisms for atmospheric composition and variations. The studies will result in improved photochemical models, and an improved understanding of the coupling between chemistry and transport

W83-70286

147-32-00

Goddard Space Flight Center, Greenbelt, Md GENERAL CIRCULATION MODELING OF THE STRATOSPHERE A Geller 301-344-8399

The objectives of this RTOP are to provide the framework to understand the natural stratosphere and its response to external perturbations and enhance our understanding of the two-way interactions between troposphere and stratosphere. The approach will be to develop computer general circulation models of the troposphere-stratosphere system and analyze stratospheric satellite data to compare against model output These studies will lead to an improved understanding of the stratospheric radiative-chemical-dynamic system

W83-70287

147-41-00

Goddard Space Flight Center, Greenbelt, Md UPPER ATMOSPHERE RESEARCH - SATELLITE DATA ANALY-SIS

S Chandra 301-344-8743

This research involves the analysis and interpretation of satellite data to understand the behavior of ozone and the other related parameters in the stratosphere and the mesosphere. The approach will be to (1) continue to develop analytical empirical models of stratospheric ozone and temperature obtained from Nimbus 4 and Nimbus 7 in which these parameters are expressed in Fourier and spherical harmonics representing time, latitude and longitude, (2) continue the correlative study of ozone and temperature fields on various time scales using frequency spectral analysis, and (3) develop a detailed analysis system of the stratosphere using a multivariate optimum interpolation analysis scheme

W83-70288

147-43-00

Goddard Space Flight Center, Greenbelt, Md CRITICAL EXAMINATION OF UPPER STRATOSPHERIC MEASURE-MENTS

J E Frederick 301-344-8232

The research will (1) provide information on the accuracy of results obtained by present satellite-borne ozone remote sensors and investigate means of distinguishing changes in instrument sensitivity from geophysical effects, (2) analyze the manner in which changes in ozone of natural and anthropogenic origin will manifest themselves in radiances monitored by orbiting backscatter ultraviolet spectrometers. and (3) perform analyses of the available waver vapor, hydroxyl radical, and nitric oxide data bases to seek behavior which could also appear in the ozone record. The approach will be to (1) perform analyses of backscatter ultraviolet radiances to delineate both their errors bars and information content. (2) couple a radiative transfer code to an existing one-dimensional photochemical-transport model to compute simulated backscattered radiances for direct comparison with satellite measurements, and (3) perform trend analyses of the available 17 year data set of stratospheric water vapor and tropical tropopause temperature. The studies will result in (1) improved understanding of the manner in which true changes in ozone will manifest themselves in a long term BUV radiance data base and how these changes can be distinguished from instrumental artifacts (2) improved understanding of possible relationships between long term trends in water vapor, tropical tropopause temperature, and ozone

W83-70289

147-44-00

Goddard Space Flight Center, Greenbelt, Md SPECTROSCOPIC PROPERTIES OF THE STRATOSPHERE R McPeters 301-344-8203

This RTOP seeks to understand the spectroscopic properties of the stratosphere to 1% accuracy Tasks include (1) analyzing continuous spectral scan data from Nimbus 7 SBUV by inverting ozone profile for each scan, and calculating Rayleigh-ozone backscatter to obtain residual radiance tape. Possible sources of residual radiance, including nitric oxide emissions will be examined in an effort to improve understanding of ozone backscatter.

W83-70290

147-51-00

Goddard Space Flight Center, Greenbelt, Md
ASSESSMENT OF OZONE PERTURBATIONS

R S Stolarski 301-344-5485

To provide continued update assessments of the status of knowledge of the stratosphere and of how the NASA research program has contributed to this knowledge, workshops will be organized at intervals of 2 to 4 years as determined by NASA Headquarters Continuity between workshops in the in-situ measurements data base started during the 1981 workshop will be maintained Long-range planning discussions for the next workshop will be held. The in-situ data base will be improved and updated.

W83-70291

147-51-02

Jet Propulsion Laboratory, Pasadena, Calif DATA SURVEY AND EVALUATION

W B DeMore 213-354-2436

An up-to-date tabulation and critical evaluation of kinetic and photochemical data relevant to the stratosphere will be maintained for use by atmospheric modelers, to aid in the establishment of research priorities, and to identify gaps or inconsistencies in the data base

Planetary Geology R&A

W83-70292

151-01-70

Jet Propulsion Laboratory, Pasadena, Calif PLANETARY GEOLOGY

R S Saunders 213-354-3815

This research uses the planetary data base from Viking, Voyager, and other missions to understand the geologic history of the terrestrial planets. In addition to data analysis, experiments and theoretical analyses are used to help guide and constrain the interpretations. Comparative studies are emphasized.

Planetary Materials

W83-70293

152-01-40

Lyndon B Johnson Space Center, Houston, Tex PLANETARY MATERIALS ANALYSIS

J W Dietrich 713-483-3274

Analysis of planetary samples is a multidisciplinary effort carried out by individual scientists and teams from universities, industries, and government agencies. Most individuals and scientific teams work with two or more types of extraterrestrial material in achieving the objectives of their proposed research. The three types of planetary materials studied (with estimated number of grants/contracts that include analyses of that type of material) are (1) lunar samples (30 grants/contracts), (2) meteorites (40 grants/contracts), and (3) cosmic dust (6 grants/contracts). The analysis of planetary samples is part of a continuing effort focused on improving our understanding of the origin and history of the Moon, Earth, and Solar System. This includes determining the age, chemical and mineralogical composition, and physical properties of

available samples of extraterrestrial material. Data obtained provide valuable information on the history of the Sun and refine baseline data for planetary processes that will aid in the planning of future planetary

W83-70294

152-02-40

Lyndon B Johnson Space Center, Houston, Tex
PLANETARY MATERIALS: LABORATORY AND ANALYTICAL
STUDIES

R J Williams 713-483-2781

(152-04-40, 153-06-40)

The objective of this research is to produce a quantitative understanding of the chemical and physical properties of planetary materials and of the processes by which these materials have been formed and evolved. This quantitative understanding is obtained through analytical studies of lunar samples, meteorites, cosmic dust, and closely related synthetic or terrestrial materials. A variety of analytical techniques--X-ray fluorescence, instrumental neutron activation, solid source and gas mass spectrometry, gas chromatography, ion and electron microprobe analysis, and scanning and transmission of electron microscopy--are used, as appropriate, to quantitatively determine the physical, chemical, and mineralogical properties of planetary materials

W83-70295

152-03-60

Ames Research Center, Moffett Field, Calif

STUDIES OF THE DISTRIBUTION OF ELEMENTS AND MINERAL PHASES AMONG METEORITES

H P Klein 415-965-5094

The objectives are to understand the origin and evolution of meteorites through the study of their chemistry and mineralogy and to gain insight into the conditions and processes that prevailed at the time of the solar system's origin. The abundance, isotopic composition and distribution of selected elements and the occurrence and distribution of various minerals in meteorites will be examined. Systematic searches for elemental, isotopic and mineralogic-petrologic correlations between meteorites and within a meteorite will be made so as to elucidate physical-chemical relationships in the meteorite population. These relationships will be used to test the hypothesis that meteorites originated as condensates from the cooling solar nebula.

W83-70296

152-04-40

Lyndon B Johnson Space Center, Houston, Tex CURATION OF EXTRATERRESTRIAL SAMPLES

D P Blanchard 713-483-3274

Care of extraterrestrial samples involves (1) maintenance of the lunar sample collection under secure, controlled environment conditions. (2) the description of samples as new materials are prepared for analysis, (3) the maintenance of records of the status and distribution of lunar samples, and the dissemination of lunar samples to approved investigator as well as for display purposes. The technical monitoring of NASA-funded grants/contracts to extraterrestrial materials investigators is also accomplished Similar functions are also performed for the Antarctic meteorite collection, including initial description, processing for distribution to investigators, and maintenance under controlled environment, dissemination of information on meteorite collection, and staff participation in field collection. Cosmic dust samples are collected and characterized using high altitude aircraft for distribution to scientific investigators, for dissemination of information and provides for development of curatorial techniques for, and education use of, materials from the various collections Operation, which is undertaken by support contractor personnel, is directed by Civil Servant scientists and administrators. Samples and information are distributed for about 65 domestic and foreign lunar sample investigator groups, over 100 meteorite investigator groups, and 6 to 10 cosmic dust investigators

W83-70297

152-05-40

Lyndon B Johnson Space Center, Houston, Tex JSC GENERAL OPERATIONS SUPPORT - PLANETARY MATERI-ALS

M B Duke 713-483-4464

This plan provides for support by JSC of a general operational nature necessary to the conduct of the OSSA Planetary Materials Program It provides in-house laboratory support and Center Operations support for the visiting scientist programs of the NASA (National Research Council, Lunar and Planetary Institute, NASA Graduate Intern, etc.) and to the Sample Curator

Geochemistry/Geophysics R&A

W83-70298

153-01-60

Ames Research Center, Moffett Field, Calif FORMATION, EVOLUTION, AND STABILITY OF PROTO-STELLAR DISKS

P M Cassen 415-965-5597

The objectives of this research are to obtain an understanding of the solar nebula and proto-stellar disks in general by analysis of theoretical models based on hydrodynamic and thermodynamic principles, and to relate these models to processes of planetary formation. The optical and infrared appearance of proto-stellar accretion disks and circumstellar dust disks are studied and the results applied to observations of solar-type and other stars in young clusters. Numerical experiments will be used to examine the stability of proto-stellar disks against gravitational condensation, and to explore the role of instabilities in disk evolution and planetary formation Results will be analyzed in the light of observations of the solar system and astronomical objects identified as proto-stars

W83-70299

153-02-40

Lyndon B Johnson Space Center, Houston, Tex

PLANETARY PETROLOGY

W C Phinney 713-483-3816

Physical and chemical constraints must be developed for the processes involved in the origin and evolution of the solid objects of the solar system. Such constraints are necessary if meaningful models are to be developed for the evolution of specific objects. The objectives of this research are to develop experimentally the values of necessary parameters that allow a quantitative understanding of the chemical and physical processes that produce observed planetary materials and to measure analytically the properties of natural occurrences that provide limits for the processes. The development of the necessary data is accomplished by means of experimentation with both natural and synthetic materials under controlled conditions of temperature, pressure, oxidation-reduction, and composition. Specific mineralogic compositions, textural relations, and phase assemblages can thus be related to specific sets of chemical and physical conditions that may occur on or within planetary bodies. These conditions provide constraints that may occur on or within planetary bodies. These conditions provide constraints for interpretations of planetary processes. Petrologic, chemical, isotopic and tectonic data and models of the evolution of planetary crusts are developed with a strong basis in lunar and terrestrial data. Major efforts will be devoted to searching for early terrestrial crustal units, studying materials from potential terrestrial analogs of early planetary crusts, and modeling crustal evolution

W83-70300

153-02-70

Jet Propulsion Laboratory, Pasadena, Calif.

JPL PETROLOGY SUPPORT

A A Finnerty 213-354-4785

The objective of this task is to constrain theories of planetary formation and evolution by application of experimental petrology, phase equilibrium and thermodynamic theory, and to relate observable surface features to models for planetary interiors. Experiments at pressures and temperatures representative of igneous and metamorphic rock-forming processes are conducted in two piston-cylinder devices at JPL, and in other facilities at other laboratories. Experimental and theoretical data on phase equilibrium and thermodynamics are incorporated into models of petrologic and thermal state of planetary interiors. Geothermometers and geobarometers are applied to terrestrial rocks, both to test their performance and to study petrologic and thermal state of the upper mantle of an accessible planet, Earth. The tested 'thermobarometers' are then applied to selected examples of extraterrestrial rocks. Certain surface features of planetary bodies, studied from spacecraft photography, are analyzed in terms of interior processes

153-03-50

Goddard Space Flight Center, Greenbelt, Md CROSS SECTION DETERMINATION, COSMIC RAY INDUCED BACKGROUND DETERMINATION, NEUTRON TRANSPORT CALCULATION AND PLANETARY EVALUATION AND DYNAMIC STUDIES

J I Trombka 301-344-5941

The objective of this investigation is to obtain cross sections and to develop neutron and gamma-ray transport methods for predicting the magnitude and spectral distribution of cosmic-ray and neutron induced gamma-ray emission from cometary, planetary and asteroid bodies. Similar calculations are required to predict the background produced in detector materials by cosmic-ray primaries and secondaries. Studies of the evaluation and dynamics of planetary bodies using the data obtained during such flight missions as Apollo, Viking, Luna, and Venera will be carried out A major problem in the interpretation of gamma-ray spectroscopic data with respect to chemical analysis of planetary bodies is the lack of information on cross sections and discrete line gamma-ray emissions from certain key elements (e.g. C, O and H). Both theoretical and experimental studies will be used to obtain this information Furthermore with the improved cross sections and spectral data, neutron annd gamma-ray transport calculations will be carried out to better understand the expected gamma-ray emission from planetary asteroids and cometary surfaces as a function of hydrogen and macroscopic cross section Correction factors for changes in the fast to thermal ratio and flux depressions will be derived

W83-70302

153-06-40

Lyndon B Johnson Space Center, Houston, Tex MANNED LUNAR BASE STUDY

W W Mendell 713-483-3816

Definition of rationale and objectives for a lunar base is necessary in order to properly plan technological and scientific analysis required for future programmatic decisions. An in-house review of previous lunar base studies will be carried out and provided to a distinguished group of science and technology experts, who will assist in preparing a baseline rationale and plan

W83-70303

153-07-40

Lyndon B Johnson Space Center, Houston, Tex REMOTE SENSING

W C Phinney 713-483-3816

The objective of this research is to optimize the ability to interpret and utilize remotely sensed data from planetary surfaces. A laboratory program based on infrared interferometry of particulate materials will define the spectral radiative transfer regime in planetary surfaces. The results, when used with remotely sensed observations, will yield data which can be interpreted in terms of the experimental work and which can be compared to results from other techniques

153-08-40

Lyndon B Johnson Space Center, Houston, Tex EXPERIMENTAL IMPACT CRATERING

W C Phinney 713-483-3816

The objectives of this task are to develop a better understanding of planetary scale impact cratering and asteroid disruption processes, the mechanisms associated with them, and the results of these processes under various conditions Data from experimental impacts carried out with the vertical impact facility will be collected through measurements of the targets after impact and through use of a high-speed (400 frames/sec) camera currently being installed. Specific studies will investigate the role of target curvature, size, and mass on cratering and disruption style, and will utilize the refrigerated target chamber in comparing impacts into various H2O ice-rich targets to more familiar rock-like targets

W83-70305

153-08-50

Goddard Space Flight Center, Greenbelt, Md

EXPERIMENTAL MAGNETISM

J Wasilewski 301-344-8317

An experimental magnetism program will be conducted to provide (1) a characterization of meteoritic tetrataenite and explanation of its role in the magnetization of meteorites, (2) a consolidation of meteorite magnetization data and publication of a review of this data pointing to statements regarding what phases carrying primary remanence, and when the remanence was acquired during the history of the meteorite, and (3) an understanding of thermal demagnetization of shock induced magnetization in Cu(Fe) alloys The experimental research effort will concentrate on the study of the new mineral tetrataenite which forms via atomic ordering, at temperatures < 300 C, and the use of the gas gun to shock impact the Cu(Fe) alloys and thermally demagnetize the resulting remanence. In addition a review will be produced, which will be a state of the art comment on meteorite magnetism. These results and any published results will be considered

153-09-40

Lyndon B Johnson Space Center, Houston, Tex EARLY CRUSTAL GENESIS

W C Phinney 713-483-3816

Physical and chemical constraints must be developed for the processes involved in the origin and evolution of the solid objects of the solar system. Such constraints are necessary if meaningful models are to be developed for evolution of specific objects. Petrologic, chemical, isotopic and tectonic studies and models of the evolution of planetary crusts are underway with a strong basis in lunar and terrestrial data Major efforts will be devoted to studying samples that are related to

the early formed crusts, searching for early terrestrial crustal units, studying materials from potential terrestrial analogs of early planetary crusts, and modeling crustal evolution

W83-70307

Lyndon B Johnson Space Center, Houston, Tex JSC GENERAL OPERATIONS - GEOPHYSICS & GEOCHEMISTRY M B Duke 713-483-4464

General operations support a variety of institutional and scientific support tasks at JSC that are considered essential for the conduct of research and for implementation of the planetary geophysics and geochemistry program. Center support services such as printing, computer, photographic, and graphics are provided to the Lunar and Planetary Institute through a procedural agreement. In-house support provides for co-sponsored of conferences, laboratory costs required by visiting scientists using existing facilities, and for costs required to operate common laboratory facilities and to provide for support services from other center elements

Planetary Atmospheres R&A

W83-70308 154-10-80

Ames Research Center, Moffett Field, Calif PLANETARY ATMOSPHERIC COMPOSITION, STRUCTURE, AND HISTORY

J B Pollack 415-965-5530

Theoretical modeling and spacecraft data interpretation are used to determine the properties and physical processes characteristic of planetary atmospheres. These properties include their temperature structure, aerosols, cloud layers, gaseous constituents, and opacity sources Emphasis is placed on reducing and analyzing data returned from spacecraft missions, such as Pionner Venus and Voyager or preparing for data expected from future spacecraft missions, such as Galileo However, use is also made of relevant ground based observations. In addition, the origin and evolution of planetary atmospheres are studied by constructing models that are constrained by relevant spacecraft and groundbased data

W83-70309 154-20-80

Ames Research Center, Moffett Field, Calif DYNAMICS OF PLANETARY ATMOSPHERES

R E Young 415-965-5515

The dynamics of the atmospheres of Venus and Mars are being studied using multidimensional circulation models. The coupled nonlinear momentum and energy equations are solved numerically using combinations of finite difference and spectral methods. The principal goals are to compare model results with spacecraft data and attempt to understand the dynamical effects of varying planetary rotation rate, solar energy deposition, infrared opacity, atmospheric mass and composition

154-20-80

Goddard Space Flight Center, Greenbelt, Md DYNAMICS OF PLANETARY ATMOSPHERES

J A Pirraglia 301-344-6783

The objective is to apply geophysical fluid dynamics to planetary atmospheres in general and to study similar dynamical phenomena under different conditions. The planets and their satellites present contrasts in mass, rotation rate, radiative time constants, heat deposition, and topographic influence on their atmospheres. These disparate atmospheres present an opportunity to apply theoretical models to a wide range of parameter space using the data obtained from planetary missions. Atmospheric circulation is strongly affected by energy and momentum transport. The relationship between the mean flow and waves that contribute to the transport processes will be investigated. This will be accomplished by the development of a general spectral solution of the equations which describe the wave mean flow dynamics. The generalized solution will be used to study the role of instabilities and forced waves in the transport of energy and momentum under the variable boundary conditions encountered on the planets

W83-70311

154-30-80

Ames Research Center, Moffett Field, Calif PLANETARY CLOUDS, PARTICULATES AND ICES

O B Toon 415-965-5971

(147-30-02, 154-10-80, 146-10-04)

A microphysical model of the Titan aerosol was developed. The model will be expanded to include condensational clouds lonization profiles of the atmosphere will be developed so that the aerosol charge can be calculated. The model will be used to simulate Titan's aerosol

layer and to compare with observations. A physical-chemical model of the Venus clouds was developed. The model was used to interpret data obtained by Pioneer Venus probe instruments. A dynamical model of radiative dynamic feedback was developed and applied to understand the albedo features observed on Venus A model of lightning generation on Venus was developed. The Venus cloud model will be used to study clouds in convectively active regions. Also Cl2 and S chemistry at the cloud top will be investigated Studies of the dynamics of the UV features will be done using a more sophisticated model A new model of Martian dust, water ice and CO2 snow will be developed and applied to study Martian particulate related phenomena. These phenomena include dust removal mechanisms, and the water vapor transport cycle The Mars related work represents a change in scope from prior activity under this RTOP

W83-70312

154-40-80

Jet Propulsion Laboratory, Pasadena, Calif REMOTE SENSING OF ATMOSPHERIC STRUCTURE G S Orton 213-354-2183 (154-10-80, 889-56-47)

The objective of this research is the development of accurate numerical approaches for the interpretation of infrared remote sensing data obtained under realistic conditions, in the presence of anticipated measurement noise as well as in the presence of clouds and aerosols Five important problems will be addressed (1) determination of atmospheric temperature profiles in the presence of clouds and aerosols when cloud cover is uniform or when temperature and cloud variations are highly correlated. (2) determination of both macro- and microphysical cloud properties, (3) determination of temperature in the presence of strong positive temperature gradients, (4) determination of gaseous abundance profiles in the presence of clouds, and (5) assembly of requisite molecular spectroscopic data for the application of these techniques in the outer solar system. The approach will use a relaxation technique developed by Chahine, coupled with accurate and efficient radiative transfer algorithms, together with a simultaneous theoretical approach to these problems. Testing of these techniques will be done using

W83-70313 154-50-80

numerical simulations of data, comparing the conditions of the generating

model with those retrieved by the technique. The model test environments

of significance in the near term will be the outer planets and Mars, in

support of Voyager and Galileo data analysis and future mission

Goddard Space Flight Center, Greenbelt, Md

ATOMIC AND MOLECULAR PROPERTIES OF PLANETARY ATMOSPHERIC CONSTITUENTS John J Hillman 301-344-7974

(196-41-54 147-10-01, 188-41-55)

experiment planning

The principal goal of this laboratory spectroscopy program is to develop an organized body of knowledge of the molecular properties of planetary atmospheric constituents. In the case of lower resolution planetary observations, such as Voyager infrared interferometer spectrometer (IRIS) (4/cm), identifications and abundance determinations require laboratory spectra of similar resolution which can be directly compared with the observations. The highest possible spectra resolution is required when single features apparent in medium or high resolution Fourier transform (FTS) spectra are compared of more than one molecular transition, and the parameters (1) frequency, (2) strength, (3) lower state energy, and (4) foreign-broadening must be known for each as input in modeling the atmosphere. For infrared heterodyne observations the need for ultra-high resolution laboratory data is especially critical, since the bandwidths accessible to these receivers are narrow and Doppler line profiles are completely resolved in the observed spectra. A combination of tuneable diode laser (TDL) and FTS laboratory spectra can supply a complete set of line parameters anywhere in the infrared In this program TDL and FTS spectrometers will be applied to selected vibration-rotation bands of planetary molecular species Tasks include analyses of new molecules identified by Voyager IRIS in Titan and Saturn, line strength determinations in Nu4 of (12)CH4 and (13)CH4, analysis of Nu9, H2O2, analysis of Nu9, C2H6, obtaining Nu2 broadening parameters for H2

W83-70314

154-60-80

Goddard Space Flight Center, Greenbelt, Md PLANETARY AERONOMY: THEORY AND ANALYSIS R E Hartle 301-344-8234

The basic objective is to study the observed properties of the neutral atmospheres and ionospheres of the planets and their satellites, including earth, in order to identify and interpret the physical and chemical processes governing their behavior, encompassing solar planetary relationships. The motivating philosophy here is that the study of processes occurring in the atmospheres and ionospheres of the planets and their

satellites provides important insights into the nature of similar processes operative in the earth's atmosphere and ionosphere under different parametric conditions and vice versa. The investigations are pursued by analyzing and interpreting experimental data derived largely from flight programs after funding from project offices has terminated. The data is used to determine the various chemical, compositional, dynamical and energetic states of the respective atmospheres and ionospheres, including the transport and deposition of mass, momentum and energy in these regimes in general, the approach involves the development of empirical descriptions of either global or small scale phenomena using data sets from a variety of spacecraft. These empirical descriptions of the atmosperes and ionospheres are subsequently interpreted using theoretical models developed to reduce the physical and chemical processes involved Some of the specific phenomena addressed in this investigation include atmospheric and ionospheric motions on Venus, Jupiter and earth, interactions of solar wind and/or magnetosphere with atmospheres of Venus, Titan, and Earth, including modification of transport coefficients by plasma instabilities, solar planetary relationships, comparative planetary atmospheres, etc

W83-70315

154-75-80

Goddard Space Flight Center, Greenbelt, Md COSMIC CHEMISTRY AERONOMY, COMETS, GRAINS B Donn 301-344-6859

This RTOP studies physiochemical phenomena in planetary atmospheres, comets, and related aspects of interstellar matter. Laser spectroscopy, photochemistry, reaction kinetics, and condensation processes are investigated and properties of atoms, radicals, molecules and grains are measured. These experimental results are used to interpret astronomical observations and develop theoretical models. Flash photolysis-resonance fluorescence apparatus with computer interface for real time analysis yields absolute atom-molecule rate constants. A CW tunable dye laser is used for radical detections. Mass spectrometry may be added to the discharge flow system. An excimer laser, alone or combined with a flashlamp, is used for sequential photodissociation studies of planetary or cometary radicals. A tunable dye laser is used to detect and study the properties of these radicals Gas phase and matrix isolation condensation are used to simulate production of primordial solar system, cometary or interstellar grains and study mechanism of production. Particle accelerator irradiated ice mixtures are used to study cosmic ray effects on comets Experiments to determine vaporization process for ice mixtures are planned using the method

W83-70316 Goddard Space Flight Center, Greenbelt, Md EXTENDED ATMOSPHERES

H A Taylor, Jr 301-344-6610

currently under study

154-80-80

154-80-80

The objective of the RTOP is to advance the understanding of comparative solar planetary relationships. Global characteristics of ionosphere neutral atmosphere variations are studied, as indicators of energy coupling processes regulating the upper atmosphere in the region extending from the exobase to the ionopause. By examining the behavior of the ionic constituents at lower altitudes near the exobase and at higher altitudes approaching the ionopause, insight is obtained with respect to collision dominated as well as collisionless processes. Studies of Venus will examine longer term effects, such as the basic planetary atmosphere evolution, as well as short term effects such as the ion and neutral response to variations in solar radiation and in the solar wind. The approach involves the analysis of global sets of satellite data describing the composition, structure, and energetic states of the planetary atmosphere-ionosphere system. These descriptions include large scale results in the form of empirical models as well as phenomenological data sets descriptive of uniquely varying conditions or events. Results of the empirical studies are assessed in terms of current theoretical models Comparison of models results for constrasting planetary conditions, e.g., Earth and Venus, are performed to test basic physical concepts Program support to the Planetary Programs Office is also provided under this RTOP

W83-70317 Jet Propulsion Laboratory, Pasadena, Calif. EXTENDED ATMOSPHERES R S Wolff 213-354-5073

To characterize the dayside Venus ionopause and to determine whether or not various classes of ionopause structures exist, and whether or not each such structure is stable against flow driven instabilities, Pioneer Venus Fields and Particles data from several instruments will be studied. Similarly, MHD discontinuities inside the Venus ionosphere will be searched for using PVO magnetometer, ion mass spectrometer, retarding potential analyzer, and electric field data. The dynamical response of the Benus ionosphere to changing solar wind conditions will be

simulated using the 1-dimensional hydrodynamic code developed by Wolff and Stein (1982) Horizontal magnetic fields and the effects of neutral molecules on the energy and momentum transport in the ionosphere will be examined by including appropriate terms in the momentum and energy equations of the code. The nature of the cometary nucleus and the ejected dust are investigated by techniques that combine a dynamical approach with photometric considerations. The aim is to interpret a broad range of dust phenomena in the coma and tail, to assess the degree of heterogeneity of the nucleus surface, and to determine the rotational constants of comets. Towards these objectives, a study of the surface morphology of Comet Halley will continue, and to this end high resolution photographs from the comet's 1910 apparition are being collected, digitized, and image processes at the present time, in collaboration with Mr SM Larson at the U of Arizona. In addition, a study of dust particle fragmentation in Comet Markos 1957 V will be performed (in collaboration with J.A. Farrell at Los Alamos National Laboratory), outgassing asymmetry for short period comets will be investigated, and work will continue on split comets

Halleys Comet Watch/Experiments

W83-70318

156-02-02

Jet Propulsion Laboratory, Pasadena, Calif. INTERNATIONAL HALLEY WATCH R L Newburn, Jr 213-354-2319

The International Halley Watch has been designed to maximize the

scientific value of ground-based observations of Halley's Comet Important in their own right, such observations will also enhance the value of space observations, setting the brief duration flyby data in the context of the overall apparition, placing the extremely high resolution encounter data into the normal scale of observations, and filling in missing wavelengths. Its goals are to standardize observing techniques wherever useful and possible, to coordinate the observing, and to collect and publish all data in a comprehensive Halley Archive The IHW is designed to avoid the problems of 1910 where the two major monographs on Halley were not published until 21 and 24 years later and where much data remains unpublished to this day. Individual nets of observers worldwide will be organized for each observing technique by Discipline Specialists selected by means of competitive proposals. The proposals were reviewed by a Steering Group of international scientists who also advise on overall IHW operations. Overall IHW coordination and Archive publication is the responsibility of a Lead Center Organization Cooperation with flight projects will be achieved through Project Representatives appointed by the projects and through mutual participation in the Steering Groups of the IHW and the Inter-Agency Committee on cooperation in flights to Halley Amateur efforts are to be coordinated by a scientist at the Lead Center working through existing amateur organizations and a small group of special consultants on such activities

W83-70319 Jet Propulsion Laboratory, Pasadena, Calif. GIOTTO HALLEY MODELING L Newburn 213-354-2319

156-03-01

156-03-02

The primary objective of this task is creation of detailed, quantitative, environmental models of Halley's Comet to aid in proper design of a spacecraft and of spacecraft instruments. Models of Halley's Comet are prepared by creating theories adequate for quantitative description of recent comets for which modern, quantitative observations exist and then applying them to Halley, scaling them to the Halley light curve and such other semiquantitative data as exist. Old plate files of the 1910 apparition are being searched for information on the rotation period and surface structure of Halley as reflected in its jet activity Other needed parameters are being obtained by analogy from observations of recent comets

W83-70320 Jet Propulsion Laboratory, Pasadena, Calif. GIOTTO EPHEMERIS SUPPORT K Yeomans 213-354-2127

The objectives under this task are to provide the European Space Operations Centre (ESOC) with information, analysis, and documented software that will allow them to independently update the orbit and ephemens of comet Halley in 1985-1986. The results of this task will be used at ESOC for operational support of the Giotto flight project The operational ephemeris software will be built from existing research software. Modifications will be made to make the software state-of-the-art and compatible with existing ESOC hardware. An effort will also be made to improve upon the existing, but imperfect, nongravitational force model for comet Halley's motion. The export software and nongravitational

force model will be completely tested, checked, and documented before being turned over to ESOC personnel

W83-70321 156-03-03

Jet Propulsion Laboratory, Pasadena, Calif
GIOTTO ION MASS SPECTROMETER CO-INVESTIGATOR

M Neugebauer 213-354-2005

The ion mass spectrometer to be flown on the Giotto mission is based, in part, on a high energy range spectrometer developed at JPL. The objectives of this task are to (1) optimize the design of this instrument for use on Giotto, (2) generate an end-to-end computer simulation of the trajectories of ions through the instrument, (3) perform experimental checks of the optical design, and (4) support the Principal Investigator of this experiment as required. The approach involves both computer simulation of the instrument and construction and testing of critical elements at the breadboard level. Frequent contact between all team members is maintained to coordinate interfaces and requirements. This task also involves the generation of required documents, support of instrument calibration, development of data-reduction algorithms, evaluation of instrument performance, analysis of flight data, and submission of reduced data to the National Space Science Data Center

W83-70322 156-03-04

Jet Propulsion Laboratory, Pasadena, Calif

GIOTTO PARTICULATE IMPACT ANALYZER (PIA) CO-INVESTIGATOR SUPPORT

Z Sekanına 213-354-7589

There are three primary objectives under this task The first is the theoretical support for the PIA experiment (Sekanina, Zook), which includes the study of the dust environment of Comet Halley, the formulation of dust models, and the structure the surface layer of the comet's nucleus. The second objective is the laboratory support for the experiment (Clark, Utterback), which includes the preparation of test projectile particles, the provision of test results and circuit design information related to the impact light-flash subsystem and the high speed ion sensor subsystem, and the assistance in developing and applying a laser blow-off ion source for particle impact simulation in flight readiness tests. The third objective is the participation in the flight data reduction and interpretation (all co-investigators), which includes the conclusions on the particle composition, mineralogy, dust production, particle mass distribution, and nucleus structure and evolution.

W83-70323 156-03-07

Jet Propulsion Laboratory, Pasadena, Calif GIOTTO DUST IMPACT DETECTION SYSTEM (DIDSY) Z Sekanina 213-354-7589 (156-03-07)

This RTOP covers two objectives (1) theoretical study of the dust environment of Comet Halley, based on 1910 data from Halley and recent data from other comets, prior to the Giotto encounter, in order to assist the dust impact detection system (DIDSY) team in experiment definition, flight strategy and data interpretation, (2) participation in the analysis and interpretation of the DIDSY data after encounter, with emphasis on the particle mass distribution, spatial distribution, dust production rate, and relation to the large body of optical and infrared remoe sensing data. Models of the dust flux, mass (size) distribution, and potential temporal and spatial variation for Halley's comet will be developed, based on observed structure in the coma of Halley's Comet in 1910, the orientation of the dust tail, and analysis of the dust thermal emission and optical scattering in recent comets expected to be similar to Halley The co-investigator will participate in the analysis of the DIDSY data, with emphasis on the mass distribution, spatial and temporal variations, and the relation between the in situ DIDSY measurements and remote sensing optical and infrared data

Planetary Instrument Definition

W83-70324 157-03-50

Goddard Space Flight Center, Greenbelt, Md X-RAY, GAMMA-RAY AND NEUTRON/GAMMA-RAY METHODS FOR PLANETARY EXPLORATION

J | Trombka 301-344-5941

The objective of this investigation is to develop remote sensing and in-situ measurement system for geochemical and geophysical exploration of the planets, asteroids and comets. The remote sensing X-ray spectrometer study will consider proportional, solid state detectors, and imaging systems. Elemental composition for elements with atomic numbers greater than Z = 6 (carbon) using solar,X-ray fluorescent spectral measurements are being considered. Both theoretical and experimental

studies will be used in the investigative program. Both gamma-ray and X-ray detector systems are significantly affected by the space radiation environment. Both induced backgrounds and radiation damage in gamma ray detectors (i.e., Nal(T1), Csl(Na), Ge(Li) and Ge (high purity)) have been studied and methods for predicting the magnitude of these effects are under development. These studies will be confirmed. There is not a great deal of information available on the effects of the space radiation environment on X-ray detectors. Such studies will be started. Balloon flights of remote sensing gamma-ray and X-ray spectrometer systems will be flown in order to ascertain their sensitivities and the magnitude of the space environment induced activity.

W83-70325

157-04-80

Jet Propulsion Laboratory, Pasadena, Calif INFRARED EXPERIMENT DEVELOPMENT D J McCleese 213-354-2317

(154-90-80)

The objective of this task is the development of advanced infrared instrumentation for NASA's program of planetary exploration from spacecraft The emphasis is on the following atmospheric science goals (1) determine the thermal structure and its spatial and temporal variability in the terrestrial and outer planets, (2) map the abundance and vertical, lateral and temporal variability of key atmospheric species, (3) measure, by direct and indirect means, atmospheric motion, and (4) determine the physical properties of clouds and aerosols. The investigation of surface phenomena is also of fundamental importance in the rational development of infrared instrumentation. In particular one objective is the application of infrared remote sensing to the identification of surface materials, determination of surface cooling rates, thermal inertia measurements and the mapping of surface morphology. The approach will be to develop in the laboratory the critical hardware for an advanced infrared sounder This developmental instrument is both versatile in the science goals which it can address and is sufficiently flexible to permit its use in future terrestrial and outer planet flight opportunities

W83-70326 157-04-80
Goddard Space Flight Center, Greenbelt, Md
IMPROVEMENTS IN NEUTRAL AND ION MASS SPECTROM-

Keith W Ogilvie 301-344-5904

The study of the composition of the volatile components of comets requires sensitive ion and neutral mass spectrometers capable of operation in a dusty environment. Because of the changing conditions the instruments are likely to encounter and the limited observation time spectrometers must be capable of multimode adaptive operation. It is anticipated that a wide range of stable molecules as well as radical species will be encountered. To effectively detect them requires ionization and separation techniques which preserve them with a minimum amount of fragmentation. Recent measurements in the magnetospheres of Earth. Jupiter and Saturn have shown the importance of plasma composition measurements, and heavy ions have been detected in the vicinity of Mars It seems likely that further study of that planet will require that the composition of plasma in its neighborhood be measured. However, some optimization of the properties of present instruments is required before their specifications fit those required to investigate the plasma regime of a planet with a small intrinsic magnetic moment and sparse atmosphere

W83-70327 157-04-80

Ames Research Center, Moffett Field, Calif VEGA BALLOON NEPHELOMETER DESIGN

B Ragent 415-965-5514

The objective of this activity is to prepare a preliminary design for a nephelometer instrument to make in-situ measurements of the properties of the Venus clouds. The instrument is to be carried on a balloon launched into the Venus atmosphere from the descent vehicle of the USSR VEGA mission. The preliminary design is to be furnished to the Centre National d'Etudes Spatiales (CNES) of France for implementation into a flight instrument by CNES. The flight instrument will be integrated by CNES into the balloon package to be delivered to the USSR by CNES for the December 1984 launch of the VEGA spacecraft. Ames Research Center is to participate fully (1) in analyzing the data to be received from this instrument as well as correlative data from other instruments aboard the balloon, and (2) in publishing the results of this experiment as a full participant and co-author.

W83-70328

157-05-50

Goddard Space Flight Center, Greenbelt, Md
PLANETARY INSTRUMENT DEVELOPMENT PROGRAM/
PLANETARY ASTRONOMY
M J Mumma 301-344-6994

(196-41-50, 188-41-55, 196-41-54)

44

This RTOP supports the development of components for advanced generation infrared spectrometers for planetary observations Task-02 addresses the development of compact, power efficient infrared heterodyne spectrometer components suitable for eventual space flight use Particular emphasis is placed on developing RF-excited waveguide CO2 lasers, passively cooled photomixers and pre-amplifiers, and integrated acousto-optic spectral line receivers. Task-03 addresses development of a long travel, mangetically suspended, cryogenic carriage for the moving mirror of a Fourier transform spectrometer Following verification of the performance of the cryogenic carriage, a brass board interferometer will be assembled and tested to verify its suitability for future space flight use

W83-70329

157-20-70

Jet Propulsion Laboratory, Pasadena, Calif. PLANETARY INSTRUMENT DEFINITION

A A Finnerty 213-354-6057

This RTOP supports two tasks development of a miniaturized scanning electron microscope and particle analyzer (SEMPA) as a potential flight instrument for inclusion on any mission that samples a planetary body or cometary dust, and development of a gamma-ray spectroscopy remote sensing space experiment to determine concentration and distribution of naturally radioactive and cosmic ray excited isotopes for a variety of elements in the surfaces of solar-system bodies. The SEMPA instrument was designed to obtain elemental analysis of particles as small as 0.25 microns and to image them with resolution of 0.04 microns A breadboard model was fabricated and is being tested to prove the concept. The effort is presently concentrated on testing the electron optical performance, and the next stages are automation of the electron optical column, testing of redundant electron emitter configurations, and demonstration of X-ray analytical capabilities. The advanced gamma-ray spectrometer utilizes a large high resolution Ge detector with sensitivity greatly superior to the Apollo instrument Scientific and engineering studies are aimed at evaluating the capabilities of the system and developing the long-lead technology subsystems needed to demonstrate feasibility. These include thermal and mechanical testing of Ge detector assemblies, study of gamma-ray response characteristics, testing of the influence of heavy ion bombardment, evaluation of interfaces with radiative coolers and of possible incorporation with an X-ray spectrometer

Solar Terrestrial and Astrophysics ATD

W83-70330

159-41-03

Marshall Space Flight Center, Huntsville, Ala ORBITING VLBI FEASIBILITY STUDY

H Morgan, Jr 205-453-3430

The purpose of this RTOP is to aid in assessing the feasibility of extending the very long baseline interferometry (VLBI) technique into space by placing one of the receiving stations in Earth orbit. The first step in an evolutionary sequence that would eventually lead to a mature free-flying VLBI observatory is to accommodate VLBI observations on the deployable antenna experiment. (This experiment is an engineering test program to evaluate and demonstrate large antenna performance capabilities in space. The concept, now under study through OSTS and DOD sponsorship, is to deploy a large antenna attached to the Shuttle cargo bay) This RTOP will assess the feasibility of accommodating VLBI observations on this experiment. Results of this effort will be integrated into the deployable antenna experiment. The scientific, functional and operational requirements for a Shuttle-attached deployable antenna to accommodate VLBI observations will be established in conjunction with interested scientists. Using these requirements and results from the ongoing deployable antenna experiment studies, the feasibility of accommodating VLBI observations will be assessed

W83-70331

159-46-01

Marshall Space Flight Center, Huntsville, Ala ADVANCED X-RAY ASTROPHYSICS FACILITY (AXAF)

C C Dailey 205-453-0162

The AXAF will be a Shuttle-launched and maintained X-ray observatory with a lifetime of about 15 years. It will provide significant improvements over all previous research capabilities in X-ray astronomy by its long life, its high performance optics and its sophisticated instrumentation. After completion of conceptual studies, parallel definitions study contracts will be issued to industry in a competition for the development program in-house and contracted supporting technology will continue to advance the readiness level in key areas A major example of technology development is the Technology Mirror Assembly Program involving two separate approaches to grinding and polishing GFE mirror blanks to AXAF performance goals. The resulting mirror systems will undergo extensive evaluation in the MSFC X-Ray Test and Calibration Facility

Earth and Ocean Physics SR&T

W83-70332

161-10-00

Goddard Space Flight Center, Greenbelt, Md **OCEAN ADVANCED STUDIES**

J T McGoogan 804-824-3411

The objectives are to (1) perform advanced studies of instrumentation and to assist in satellite mission definition as required to support future ocean program goals, (2) improve the quality of instrument measurements and accuracy of algorithms, while reducing the power, data load and cost where feasible to enhance the probability of flight opportunity, and (3) develop the hardware required to accomplish these goals. A long range plan will be developed and system studies, instrument design, modeling, simulations, laboratory tests, aircraft experiments and error assessments will be performed to assess various approaches for implementation of measurement systems. A plan for a Shuttle ocean instrumentation experiment will be developed. Orbit determination techniques will be assessed. New attitude tracking algorithms that are less susceptable to bias will be developed Experimental hardware will be developed for wave tank laboratory testing of radar reflectivity versus wind and wave conditions. A total system design for implementing an ocean color imager on an advanced Tiros-N satellite will be developed including definitive costs and schedule to support a new initiative for FY-84 Scatt accommodation studies on the most probable spacecraft will be accomplished. Instrument specifications to meet SWG requirements will be developed Basic backscatter studies, experiments, algorithm evaluations and over all-to-end system plans will be developed

W83-70333

161-10-01

Jet Propulsion Laboratory, Pasadena, Calif **RESEARCH MISSION STUDY - TOPEX**

A Yamarone 213-354-7141

A total observational system for the measurement and monitoring of global ocean circulation will be defined through the use of an Earth orbiting system capable of providing dedicated high resolution altimetric measurements of dynamic ocean surface topography. Specifically, the study will include (1) the preliminary configuration of the mission including precision orbit determination capabilities. (2) the preliminary configuration of all elements of TOPEX including sensor configuration by the appropriate implementing center, (3) the preliminary definition of the interface requirements and integration activities of the major TOPEX elements, (4) the development of a management plan, procurement strategy, and implementation schedule, and (5) the development of detailed cost information. Science and mission requirements were developed in FY-80 and finalized in FY-81 Mission and satellite concepts were assessed in FY-81 and lower cost mission and systems assessed in FY-82. The approach for FY-83 will be to refine the configuration of all elements of the observational system, perform limited development of critical sensors, pursue further analysis and definition of precision orbit definition system and pursue further avenues of cost reduction

161-10-03

Jet Propulsion Laboratory, Pasadena, Calif ADVANCED EARTH ORBITER RADIO METRIC TECHNOLOGY DEVELOPMENT W G Melbourne 213-354-5071

(161-20-01)

Late in 1980 it was recognized that subdecimeter orbit determination required by future application missions such as TOPEX cannot be provided by laser tracking without tailoring the spacecraft design to minimize drag effects and considerable expansion of the number of laser tracking sites. Both of these requirements are significant cost drivers. This RTOP was initiated in FY-81 to rectify this situation by investigating and developing a radio metric tracking system that can provide an order of magnitude improvement in current low Earth Satellite orbit determination capabilities without prohibitive spacecraft or ground system requirements. The need for such an advanced tracking system. has been increased with the addition of the scatterometer option to the TOPEX spacecraft with the attendant lowering of the orbit altitude and an increase area to mass ratio of the satellite. Recently with the effort to minimize the dependency of TOPEX on GRAVSAT, this advanced radio metric tracking system has taken on the additional task of providing data which can be used to substantially improve the good for wavelengths of 1000 km and longer. The first year of this RTOP was spent performing preliminary accuracy and cost analysis studies for several candidate tracking systems. Early in the second year the RTOP tem recommended placing the analysis, design and demonstration emphasis on a tracking system composed of the 18 GPS Navstar satellites and GPS receivers at approximately a dozen unattended ground stations and on the TOPEX spacecraft. This system, called SERIES-X, appears to be feasible, economical, and has the potential of giving at least an order of magnitude improvement over existing systems. Since this system involves new technology, a feasibility demonstration will be carried out under this RTOP

W83-70335 161-20-00

Goddard Space Flight Center, Greenbelt, Md PHYSICAL OCEANOGRAPHY D B Rao 301-344-4713

The objective is to conduct a variety of oceanic research activities which are important to the agency's physical oceanography program and will contribute to particulate aspects of the program as they evolve Among these activities are studies involving the calculation of oceanic tides, upper ocean dynamics and thermodynamics, North Atlantic mesoscale features, remote sensing of ocean circulation, microwave radar oceanography, microscale ocean surface dynamics, ocean circulation and topography, advanced location and data collection systems, a surface contour radar for ocean wave studies, and research applications of ocean data in large-scale forecasting models. Approaches to the variety of problems include the application of Goddard modeling and sensors and system development capabilities. The RTOP supports the Oceans Program and the end objectives of understanding, predicting and managing the environment

W83-70336 161-20-07

Jet Propulsion Laboratory, Pasadena, Calif ALTIMETER TIME-DEPENDENT CURRENT STUDIES M E Parke 213-354-2739

The objective of this work is to investigate two-dimensional mapping of time varying ocean topography, and to apply the results to some areas of known geophysical signal where some ground truth is available The approach is to estimate the orbit error via a small area crossing arc program. These results extend 'naturally to an estimate of the time history of the orbit error for SEASAT mission. When this estimate of the orbit error is removed from the altimeter data and the results binned allowing for the mean background gradient, a mean sea surface is produced A map of residual variability can also be produced. The altimeter data with the orbit error estimate removed will be used to investigate the spin-up of the Somalia eddy under the monsoon wind, and to investigate the correlation of the height variability in the Antarctic Circumpolar Current with variations in the zonally averaged wind speed

161-20-10 W83-70337

Jet Propulsion Laboratory, Pasadena, Calif **GULF OF MEXICO CIRCULATION STUDIES** G H Born 213-354-4644

(161-10-01, 161-20-12)

The objective of this research is to study the use of satellite altimetry and scatterometer wind data with in situ data for the description of ocean circulation in the Gulf of Mexico. In particular, data from the SEASAT altimeter and scatterometer, as well as in situ data, will be used to provide boundary conditions for a numerical circulation model of the Gulf This research will answer fundamental questions regarding techniques for the assimilation of satellite and in situ data into circulation models, the effects of error in this data on the circulation model, and what new information on the circulation in the Gulf of Mexico can be gleamed from the combined use of satellite and in situ data with numerical

161-20-11 W83-70338 Jet Propulsion Laboratory, Pasadena, Calif

TIME DEPENDENT FIELDS D B Chelton 213-354-7151

There are two primary objectives of this project. The first is to evaluate the scientific usefulness of satellite wind estimates by determining the accuracy with which they measure wind speed and direction. In part, this involves comparison of the satellite estimates with conventional in situ measurements from ships and buoys. Another approach being used to satisfy this first objective is the intercomparison of global maps of wind speed measurements averaged over weekly and monthly time intervals by all three satellite wind sensors (altimeter, scatterometer and scanning multichannel microwave radiometer) The second objective is the eventual incorporation of satellite wind measurements in statistical studies of the large-scale dynamics of wind-driven ocean circulation. The approach to be used in accomplishing this objective is to use conventional hydrographic measurements from ships and sea surface elevation measurements from the SEASAT and GEOS-3 satellite altimeters to quantify the near-surface ocean circulation These parameterizations of the ocean circulation can then be statistically

related to the satellite wind measurements using standard analysis techniques

W83-70339 161-30-00

Goddard Space Flight Center, Greenbelt, Md OCEAN OPTICS

D B Rao 301-344-4718

The objective is to conduct a variety of ocean optics research and development activities which are important to the agency's oceanography program and will contribute to particular aspects of the program as they evolve Among these activities are studies involving the refinement of the SMMR ocean algorithm, coastal and estuarine dynamics processes research. CID color scanner development, applications of laser techniques, and a comparative study of ocean upwelling regimes using visible and IR imagery. Approaches to the variety of problems include the application of Goddard algorithm sensor, and system development capabilities, the conducting of experiments, and the analysis of satellite and aircraft data The RTOP supports the Oceans Program and the end objectives of understanding, predicting and managing the environment

W83-70340 161-30-01 Jet Propulsion Laboratory, Pasadena, Calif.

OCEAN APPLICATIONS DEVELOPMENT PROGRAM D R Montgomery 213-354-2339

The Program objectives for FY-83 will focus on a scaled-down version of the fisheries applications task and the start of a pilot effort, in cooperation with the Canadian Ice Central, the NOAA-NWS and the Navy-Fleet Numerical Oceanography Center, to utilize Nimbus-7 SMMR ice observations in support of commercial off-shore oil and gas operations, arctic transportation activities, NWS forecasts for Alaska mariners and Navy operations. The fisheries applications task will phase down to a point of continuing level support of the CZCS data processing at Scripps Institution of Oceanography so that it continues to be accessible to NOAA-NWS and the fishing industry. Elements of the application task involving tailored fisheries-aids products will be transferred to NOAA-NWS and/or the private sector. A final evaluation report will be prepared with the results of all previous work. The Nimbus-7 SMMR ice pilot effort will involve the near real-time processing of the SMMR data at FNOC for user applications and in preparation of ice forecasts. Both U.S. & Canadian participants will provide resources at no cost to either governments

W83-70341 161-30-05

Jet Propulsion Laboratory, Pasadena, Calif LIDAR AND ACOUSTICS APPLICATIONS TO OCEAN PRODUCTIV-ITY

D J Collins 213-354-3473

The objective of this research is to develop in situ instrumentation capable of examining the vertical structure of the phytoplankton and zooplankton communities in the ocean to provide a detailed description of the three-dimensional structure of the ecological systems involved in ocean productivity. These measurements form one part of a long-term effort to monitor the productivity of the world's oceans using oceanic LIDAR from aircraft and using satellite instrumentation to provide images on a global scale. These objectives will be achieved by (1) development of an in situ LIDAR instrument capable of remote measurement of the fluorescence and spectral reflectance from chlorophyll and other pigments. This unit will use the water Raman return as a measure of the optical properties of the water column, and will use Raman and Brillouin scattering for the remote measurement of temperature, (2) development of a linearly frequency modulated sonar instrument capable of measuring the vertical distribution of zooplankton species in the euphotic zone, and (3) development of a towed submersible that will provide a stable platform for the in situ instrumentation and that will provide physical oceanographic data and calibration data required for these measurements

W83-70342 161-40-00 Goddard Space Flight Center, Greenbelt, Md

POLAR OCEANOGRAPHY D B Rao 301-344-4718

The objective is to conduct a variety of ice research activities which are important to the agency's program and will contribute to particular aspects of the program as they evolve Among these activities are studies on coupled models of oceans and ice, and involving mesoscale ice dynamics and processes observations, and Bering Sea marginal ice zone processes and remotely sensed observations, numerical modelling of sea ice dynamics and ice thickness, and studies of remote sensing of sea ice flow distribution and surface topography. Approaches to the variety of problems include the applications of Goddard capabilities to

the study of modeling and remote sensing problems, as well as the involving of leading researchers at institutions such as the Cold Regions Research and Engineering Laboratory, the University of Washington, and the Polar Science Center The RTOP supports the Oceans, Ice and Climate Programs and the end objectives of understanding, predicting, and managing the environment Expected results include improved knowledge of coupled models of oceans and ice, mesoscale ice dynamics and processes. Bearing Sea marginal ice zone processes, sea ice dynamics and ice thickness, and sea ice flow distribution and surface topography

W83-70343

161-40-02

Jet Propulsion Laboratory, Pasadena, Calif COUPLED ACTIVE-PASSIVE SEA ICE ANALYSIS

D Carsey 213-354-8163

The objectives of this work are to develop and improve methods for extracting sea ice information from the SEASAT active and passive microwave data sets and from planned future satellite data sets, and to examine the behavior and distribution of the Arctic ice pack at the 1978 summer-fall transition using the SEASAT record. The approaches used are (1) computer-aided feature tracking in SAR images to evaluate ice velocity and deformation measurement methods. (2) computer-aided feature classification of SAR images to develop ice type determination methods and to serve as validation for other sensor radiometric constant measurement, (3) examination of FIREX and other in-situ data and overlays of radiometer, scatterometer, and altimeter data on SAR images and on each other to determine responses of these sensors to ice type and open water fraction, and (4) region-wide analysis of radiance and backscatter to examine seasonal changes, observe overall behavior, and compare data sets from different instruments as though they were from different platforms

W83-70344

161-50-00

Goddard Space Flight Center, Greenbelt, Md OCEANIC RESEARCH SUPPORT ACTIVITIES

D B Rao 301-344-4718

The objective is to provide support for a variety of oceanic and ice research activities which are important to the agency's program and will contribute to particular aspects of the program as they evolve Among these activities are studies of ocean circulation, water mass processes and eddies. Approaches to the variety of problems include the application of Goddard capabilities to the study of modeling problems, as well as the involving of leading researchers at institutions such as the Woods Hole Oceanographic Institution, the Massachusetts Institute of Technology, Harvard University, and the Polar Science Center through a vigorous program of scientific seminars and cooperative research activities The RTOP supports the Oceans, Ice and Climate Programs and the end objectives of understanding, predicting, and managing the environment

W83-70345

161-50-02

Jet Propulsion Laboratory, Pasadena, Calif

OCEAN PROCESSES BRANCH SCIENTIFIC PROGRAM SUP-

M T Chahine 213-354-2433

The objective of this task is to support the NASA Oceanic Processes Branch in the development and use of remote sensing techniques to study physical and biological oceanic processes and their interactions with the atmosphere

Weather and Climate SR&T

W83-70346

175-13-00

Goddard Space Flight Center, Greenbelt, Md SEVERE STORMS AND LOCAL WEATHER RESEARCH

Simpson 301-344-6923

The objectives are to (1) utilize space observations to improve understanding, diagnosis, and predictability of severe atmospheric storms (tropical and mid-latitude) (2) develop analysis and interpretation techniques using data from satellites in combination with other sources. (3) adapt subsynoptic and storm scale numerical models to use satellite and conventional data, (4) simulate impact of satellite measurements on severe storm analyses, and predictions, (5) cooperate with NOAA and other user agencies on technology transfer and evaluation of new technology involving space observations, and (6) formulate requirements for future satellites to improve severe storm diagnosis, warnings Quantitative methods to utilize satellite data in predictive models, diagnostics, and nowcasting will be developed. The scientific accuracy and usefulness of VAS geosynchronous soundings will be evaluated Case studies will be conducted utilizing AOIPS to synthesize data sets, often with model output, to improve physical understanding and predictive capability Combined satellite, remote aircraft, and in situ data sets will

be obtained from participation in joint field programs numerical storm-scale, and subsynoptic scale models will be adapted to use satellite data in initialization, model improvement, and data interpretation

W83-70347

175-20-00

Marshall Space Flight Center, Huntsville, Ala

DEVELOPMENT OF NEW REMOTE DATA INTERPRETATION TECHNIQUES

W W Vaughan 205-453-3100

The objective of the research is to contribute to the NASA severe storms and local weather research program by conducting applied research and development activities using space-related techniques and observations that will increase the basic understanding of storms and local weather, thereby leading to improved accuracy and timeliness of local weather forecasts and severe weather warnings. Utilizing the talents of university and private contractor groups, plus the MSFC in-house talents and laboratory capabilities, specific research activities as described in the tasks of this RTOP will be accomplished

W83-70348

175-40-00

Marshall Space Flight Center, Huntsville, Ala REMOTE SENSOR DEVELOPMENT W W Vaughan 205-453-3100

The objective is to contribute to the NASA severe storms and local weather research program by conducting applied research and development activities using space-related techniques and observations that will increase the basic understanding of storms and local weather, thereby leading to improved accuracy and timeliness of local weather forecasts and severe weather warnings. Utilizing the talents of university and private contractor groups, plus the MSFC in-house talents and laboratory capabilities, specific research activities as described in the tasks of this RTOP will be accomplished

Pollution Monitoring SR&T

W83-70349

176-10-00

Goddard Space Flight Center, Greenbelt, Md GLOBAL TROPOSPHERIC MODELS

W Stewart 301-344-8895

The objectives of this RTOP are (1) to develop an understanding of tropospheric environmental problems that may be amenable to solution through the use of remotely sensed data, (2) assess the impact of urbanization and industrialization on global, regional, and urban air quality, and (3) develop, evaluate, and demonstrate remote sensing concepts for observing the nature and distribution of tropospheric pollution. The approach will be to continue the development of global tropospheric models for calculation of tropospheric trace species concentrations, develop regional-scale models for study of heterogeneous processes in various tropospheric composition domains, improve the description of physical processes in one and two-dimensional models, and continue study of satellite methods of monitoring air pollution. The research will lead to the (1) completion of a latitude dependent study of the seasonal variations of odd nitrogen in the troposphere. (2) extension of formulations of tropospheric box model to include description of rainout of all soluble species, and (3) development of a method for computing aerosol pollution flux from satellite and wind data

176-10-00

Goddard Space Flight Center, Greenbelt, Md

GLOBAL TROPOSPHERIC MODELING OF TRACE GAS DISTRIBU-TION

David Rind 212-678-5589

The objectives are to make contributions toward understanding the global budgets of the primary trace species and man's potential impact on the trace gas abundances and determine measurement requirements and sampling strategies for the tropospheric air quality program. The dimensional studies of trace gas distributions will be performed in cooperation with McElroy (Harvard University) A progressive series of studies of trace gases will be employed involving freons (source known, checks ability to model global transports including stratospheric/ tropospheric exchange), methyl chloroform (source known, checks chemistry involving OH), and carbon monoxide (sensitive to OH, provides information on sources)

W83-70351

176-30-01

Jet Propulsion Laboratory, Pasadena, Calif
KINETIC STUDIES INVOLVING CH302, HO2 AND IO RADICALS OF TROPOSPHERIC IMPORTANCE

S P Sander 213-354-2625

A program of laboratory studies will be conducted to measure key

rate constants for reactions of hydroperoxyl (HO2), methylperoxy (CH3O2) and iodine oxide (IO) radicals. The goal of this program is to improve and enlarge the kinetics database for reactions of tropospheric importance involving these radicals. The experimental approach will be to utilize the techniques of flash photolysis, discharge flow-mass spectrometry and Fourier transform infrared spectroscopy

W83-70352 176-40-03

Jet Propulsion Laboratory, Pasadena, Calif DEVELOPMENT OF RESONANT IONIZATION LASER SPECTROS-COPY FOR TROPOSPHERIC NOX MEASUREMENTS

J B Laudenslager 213-354-2259

The objectives of this work are to develop a sensitive and selective in-situ measurement technique, resonant ionization laser spectroscopy, for tropospheric NOx measurements, extend the measurement capabilities, in subsequent years, to other important tropospheric molecules, and make field measurements of tropospheric NOx from ground and aircraft platforms after confirmation of this technique from the preliminary laboratory studies. The resonant ionization laser spectroscopy detection of NOx will first be demonstrated in the laboratory using commercial dye laser systems to identify laser wavelengths, pulse energies, and repetition rates required for field measurements of NOx in the parts-per-trillion range. Computer simulations of the resonant ionization technique indicate that sensitivity for both NO and NO2 of a part-pertrillion with small error limits is feasible. The field measurements for NOx will require compact, tunable, high pulse energy ultraviolet laser sources at selected wavelength regions It is planned to develop tunable ultraviolet excimer lasers for this application, and this excimer laser construction will be co-funded by an OAST-supported program for laser development. The successful development of the resonant ionization laser spectroscopy detection method for tropospheric species will enable concentration measurements of several chemically coupled trace species to be made simultaneously with potentially smaller error limits than have been possible with other measurement techniques Simultaneous measurement of NO, NO2, O3, OH and JNO2 are particularly important for tropospheric chemical models to characterize the sources and sinks of tropospheric ozone

Space Processing Applied Research and Data Analysis

W83-70353 179-11-20

Jet Propulsion Laboratory, Pasadena, Calif **GLASS RESEARCH**

George F Neilson 213-354-6365

The overall objective of this RTOP is to obtain both fundamental and practical information pertaining to the preparation and processing of glasses in a space environment. These studies will establish a quantitative scientific basis for containerless experiments with glass forming materials. The work in FY-83 will continue our studies with gel-derived glasses and of glass nucleation and crystallization behavior, and it will reinitiate a study of bubble behavior. The objectives for FY-83 are to (1) determine the variation in properties of sodium borosilicate gels and glasses derived therefrom as functions of gel preparation and drying procedures, (2) conduct detailed crystal nucleation studies in several glass systems, and (3) study bubble dissolution (growth) in glass melts with and without the use of refining agents in systems containing a single gas bubble. The activities under (1) will include the structural analysis of both the gels and gel derived glasses employed IR spectroscopy, X-ray powder diffraction and small angle X-ray scattering, as well as a study of the phase separation process in the glasses Under (2) a detailed study of the mechanism of internal and surface crystal nucleation in lithium diborate glass will be made, as well as a study of crystallization and the crystal nucleation mechanism in sodium disilicate glass. Under (3) theoretical and experimental studies will be performed and compared Experiments will consist of the measurement of the radius of a bubble in a glass melt as a function of time Calculations will be made using theoretical models formulated previously Also, extensions of preliminary theoretical developments on bubble dissolution (growth) in chemically reactive systems will be given

W83-70354 Lyndon B Johnson Space Center, Houston, Tex BIOPROCESSING STUDIES

Dennis R Morrison 713-483-5281

(179 - 13 - 62)

The objectives of this effort are to provide biological expertise (cell handling, cell culture, cell separation and bioassays) and to perform flight experiments in support of the materials processing in space

program The JSC Bioprocessing Laboratory will coordinate the tissue culture, bioassays and cell characterization phases of projects with MSFC, university based investigators, and NASA Hqs Emphasis is currently placed on cell culture and ground based cell separation techniques Procedures to achieve maximum cell viability and growth before and after electrophoretic separations and assays for cell products will be developed. The limitations of ground based cell culture will be evaluated and the advantages of culturing mammalian cells under weightless conditions will be identified. The JSC Bioprocessing Laboratory is staffed with 4 civil service and 4 contractor professionals (including 3 Ph D's and 2 MS's) with experience in cell molecular biology, microbiology, cell culture technology, and aerospace systems engineering. A National Research Council post-doctoral associate is also a member of the laboratory group. The JSC biological space processing group will coordinate their efforts with the MSFC bioprocessing activity and will support the Separation Processes Branch (MSFC) in (1) development of separation technology, (2) development and construction of hardware for separations, (3) integration of space processing hardware, (4) mission control and payload operations, and (5) launch site operations

W83-70355

179-15-20

Jet Propulsion Laboratory, Pasadena, Calif MULTIMODE ACOUSTIC RESEARCH Martin Barmatz 213-354-3088

(179-13-20, 170-50-20)

This RTOP will provide fundamental research support for the advanced containerless processing technology program. New classes of acoustic levitation have been discovered at JPL in rectangular, cylindrical and spherical geometries that may be attained by the excitation of multidimensional acoustic modes (multimodes) These new levitation principles provide us with advanced alternative methods for positioning and manipulating molten materials, which may lead to rapid cooling, separation of levitation and rotation capabilities, and the selection of arbitrary axes of rotation. The long term objectives of this RTOP are (1) to develop theoretical acoustic models of these levitation classes and (2) to provide experimental validation of these models using research levitation devices. The FY-83 activities will continue to develop a more fundamental understanding of these acoustic multimode levitation properties The objectives for FY-83 are to (1) experimentally study multimode levitation in spherical and long cylindrical chambers, and (2) develop theoretical expressions for multimode acoustic forces and associated stable levitation positions in the presence of a temperature gradient. As these new, versatile techniques are verified, they will be incorporated into the advanced containerless processing technology program

W83-70356 179-20-55 Jet Propulsion Laboratory, Pasadena, Calif ADVANCED CONTAINERLESS PROCESSING TECHNOLOGY T G Wang 213-354-6331 (179-70-10, 179-20-56)

The long range objectives of this task are to (1) study and advance the science of contactless positioning and manipulation in a high temperature acoustic containerless processing chamber, (2) provide technical information to acoustics containerless experimental system (ACES) engineering team, (3) develop a set of high temperature ground based containerless facilities for precursor material processing experiments Under this RTOP, breadboards for high temperature containerless processing systems will be developed, the principles of operation will be studied, the performance will be characterized, the limitations identified, and the influences of the acoustic field on the samples established The subjects to be addressed in FY-83 are experimental and theoretical studies of (1) acoustic positioning and manipulation capabilities in a high temperature gradient environment (from 25 C to 900 C), (2) acoustic waveforms, harmonic contents, power transfer, sample transport and stability associated with a high temperature gradient system, (3) high temperature ground based levitation systems which will allow one to melt, process, and solidify samples without crucibles in the laboratory, (4) KC-135 and laboratory tests of various acoustic geometries which may have special applications in material processing in space program, and (5) provide technical information to ACES engineering team and establish the operation conditions for ACES

179-20-56 W83-70357 Jet Propulsion Laboratory, Pasadena, Calif. **ELECTROSTATIC CONTAINERLESS PROCESSING TECHNOLOGY**

D D Elleman 213-354-5182 (179-20-56, 179-20-57)

179-13-72

The long range objective of the Electrostatic Task is to develop the science and technology base that is required for contactless positioning and manipulation of high temperature materials using electrostatic and electrophoretic forces. An electric field containerless processing module-

179-46-20

(EFCPM) operating at room temperature will be demonstrated by the end of FY-83 The successful demonstration of the room temperature EFCPM and the results from the high temperature charge loss studies will lead to the design and development of a high temperature facility and flight models of the EFCPM. This program will include both theoretical and experimental investigations as well as reduced gravity tests of the module on the KC-135 aircraft in conjunction with the electric field positioning science workshop group the definition of potential MPS flight experiments utilizing the EFCPM will be given the highest priority in FY-83 Near term objectives to be addressed in FY-83 include the continuation of the low gravity tests of the room temperature bulk electrostatic postioning module. Both the single axis module and the three axis tetrahedral electrode module will be tested. The present modules use CCD cameras for sampling position sensing During FY-83 a capacitance sensing technique will be tested. The capacitance method has several advantages over the optical method (1) at high temperatures the capacitance measurement will not require a window with the subsequent thermal problems associated with windows, (2) at very high temperatures sample definition can become poor in the optical method since both the sample and chamber walls will emit equivalent radiation The capacitance method should be impervious to the high temperatures. Also during FY-83 an acoustic-electric field hybrid module will be designed and constructed. The final major objective in FY-83 will be to build and initiate tests on an elevated temperature electric field positioning module

179-20-57

179-40-62

179-40-62

W83-70358 Jet Propulsion Laboratory, Pasadena, Calif SPHERICAL SHELL TECHNOLOGY STUDY T G Wang 213-354-6331 (179-20-55)

The long range objectives of this task are to (1) study the dynamics of liquid bubbles and of the gravitational effects relevant to the production of spherical shells both in the laboratory and in a weightless environment, develop the technology that is pertinent to the production of metallic and metallic glass shells of various dimensions and aspect ratios. (3) develop and construct high temperature and high cooling rate facilities that are needed to produce refractory metallic and metallic glass spheres, and (4) develop technology applicable to the production of a novel high strength low weight material by bonding of the spheres In order to produce the high quality spherical shells that are required, three parameters must be controlled accurately the shell dimensions, shell sphericity, and concentricity, and the surface topology of the shell The present shell fabrication techniques are not set up to study the fundamental physical processes which control those parameters separately Attempts to conduct experiments on the dynamics of liquid bubbles (molten shells) in laboratories are limited by a strong coupling among the three parameters, time, gravity, and temperature. The work described here will circumvent these limitations and enable detailed study of each of the important processes through use of low gravity environments collectively available in drop towers, in KC-135 flights, in a neutrally buoyant immiscible system, and in an acoustic levitation system

W83-70359 Jet Propulsion Laboratory, Pasadena, Calif EXTRATERRESTRIAL MATERIALS PROCESSING Paul G Gordon 213-354-8610 (179 - 10 - 62)

The objective of this RTOP is to develop and implement a program plan for the utilization of space resources. The plan, which is titled 'Use of Space Resources' will provide the guidance for initiating ground based experiments to develop a data base for future planning of space operations The Jet Propulsion Laboratory has already been working on the first phase of this plan and the effort will be expanded to include university participation. Coordination of the effort will be provided by P G Gordon who will be assigned as a detailee to NASA Headquarters, Office of Materials Processing in Space

W83-70360 Marshall Space Flight Center, Huntsville, Ala MPS AR&DA SUPPORT

J R Williams 205-453-5961

The objectives of this RTOP are to provide the necessary management and support manpower to implement the materials processing in space (MPS) research and technology development effort, and to provide the MPS program with an effective means of interacting with the various scientific communities involved for the purpose of (1) making them aware of the research opportunities offered by the MPS program, (2) stimulating their interest and active involvement in the program, (3) gauging their response to the scientific results being obtained by the program. (4) identifying research areas in which the program should concentrate. (5) initiating in-house research activities in selected topics pertinent to the MPS program, and (6) evaluating the ongoing research effort. The MSFC will ensure the necessary professional and supporting manpower to implement the MPS research and technology development effort. Also, the stated objectives will be met by actively involving the various research communities in the MPS program through working groups, seminars and workshops, science reviews, and a visiting scientist program In addition, scientific goals and accomplishments of the program will be documented and disseminated to the science communities in the form of a published bibliography and catalog of tasks

W83-70361 Jet Propulsion Laboratory, Pasadena, Calif RESEARCH OF THE USE OF SPACE RESOURCES R A Boundy 213-354-4299 (179-45-20)

The objective of this RTOP is to develop an understanding of the basic physical properties and principles which control the rates and the practicality of candidate extraterrestrial materials processes. That understanding will allow objective decisions to be made regarding processing and use of extraterrestrial materials in space. It will also provide the technical foundation for a development program when a decision is made to proceed with utilization of space materials. The specific objective for FY-83 is to continue and extend the FY-82 effort to evaluate the feasibility of candidate processes with emphasis on understanding the underlying physical principles and rate determining parameters Analytical and experimental investigations will concentrate on silicate processing, magma electrolysis, and vapor phase separation Analysis will continue on alternate (new) processes, as well as supporting technologies (transportation, energy), exploration, and resource identification in vapor phase separation emphasis will be put on the selective ionization processes. In magma electrolysis emphasis will be on melt properties and process depleted compositions. In silicate processing the emphasis will be on melt studies and compaction-densification of mock silicate materials. The strong university involvement initiated in FY-82 will continue and will compliment the in-house effort

W83-70362 179-60-62 Marshall Space Flight Center, Huntsville, Ala COMMERCIAL MATERIALS PROCESSING IN LOW-GRAVITY R L Brown 205-453-4880

The overall objective of this RTOP is to foster commercial uses of materials processing in low gravity (MPLG) technology in ways which will lead to new or improved processees/products on Earth and in space, and thus to benefits for the general public. The overall approach involves working directly with private and select federal organizations to stimulate interest in MPLG and lay the groundwork for use of MPLG in ways which will benefit the public. Due to the embryonic nature of MPLG technology at this time, an in-depth working relationship must be established with interested organizations wherein they can develop an understanding of how MPLG technology can meet their specific needs. Also, the factors which influence the development of an infrastructure to support an MPS industry or industry segment must be understood This RTOP provides for developing three progressive levels of working relationships on a case-by-case basis, as well as for developing an understanding of the technical and institutional issues which influence technological innovation based on MPLG technology

W83-70363 179-75-10 Marshall Space Flight Center, Huntsville, Ala CLOUD PHYSICS

J R Williams 205-453-5961

The goal of this research is to better understand the microphysical processes in atmospheric clouds responsible for precipitation formation. electrical properties of clouds, and the production/removal of gases and aerosols in the atmosphere. The dominant microphysical processes are phase transitions, fluid flow and gas or particulate transport at or near phase transition interfaces, charge transfer and other electrical phenomena, etc. The approach is to define and execute experiments and supporting theoretical studies which will improve understanding of the fundamental properties of these microphysical experimental concepts which utilize low gravity environments provided by KC-135 aircraft or Space Shuttle flights

W83-70364 Marshall Space Flight Center, Huntsville, Ala **CONTAINERLESS PROCESSING**

J R Williams 205-453-5961

The objectives of this activity are to (1) explore novel techniques and applications for containerless processing or glasses and refractory materials, (2) understand the limitations imposed by the gravitational field, and (3) evolve meaningful flight experiments which extend processes

179-80-30

beyond gravity limitations Containerless processing in space requires low level levitation forces to compensate for microgravity acceleration and maintain position of the sample. The central reason is the elimination of extraneous effects from contact with solid containment walls. The implementation of appropriate experiments will involve the following (1) a 31-meter drop tube at MSFC provides 26 seconds of free fall for solidifying molten droplets up to several mm diameter (2) a single axis acoustic levitator has been developed which uses a high-Q driver with a single resonant frequency, (3) a three-axis acoustic levitator has also been under development involving three mutually orthogonal drivers which produce a three-dimensional sound field (spherical energy well) in a tuned cavity, (4) a 10 kW electromagnetic levitator facility, which by careful coil design maximizes Grad B/B, is in use to levitate samples with a minimum of heating, and (5) aerodynamic levitation using a jet of air from a carefully designed nozzle has been used to suspend highly reactive samples

W83-70365 Marshall Space Flight Center, Huntsville Ala **BIOSEPARATION PROCESSES** J R Williams 205-453-5961

The long range objective is to utilize the environment of space to separate and purify biological products. The intermediate objectives are to develop the required technology and to expand the base of knowledge involved with processing biologicals in space, to identify, evaluate and select the most promising processes and to explore new areas of separation technology Separation and purification procedures which have been found to produce inadequate results on the ground because of gravity dependent problems will be evaluated and investigated More specifically, this program will (1) determine possible advantages of the low gravity environment for separation and characterization of biomedical materials (2) design and conduct experiments in space, (3) apply ground/flight knowledge to the improvement of bioprocessing procedures on Earth (4) develop broad and strong collaborative interactions with researchers and (5) identify and explore new techniques of separation or bioprocessing that might be enhanced by low gravity

W83-70366 179-80-51

Lewis Research Center Cleveland Ohio REDUCED GRAVITY COMBUSTION SCIENCE Thomas H Cochran 216-433-6897

(506-56-21, 694-01-01, 694-03-01)

The objective of this effort is to provide the capability to conduct research in space on fundamental combustion phenomena in order to define governing mechanisms, validate theoretical models, and obtain unique data unavailable to date because of the limiting and masking effects of gravity. Work in this RTOP will be devoted to (1) an assessment of the program by a group of recognized scientific experts (2) the preliminary design of individual experiments to be flown on the orbiter middeck and (3) the definition of a Spacelab facility. The LeRC will provide the technical and management support to direct all contract activities and to provide coordination between government groups contractors, and the scientific community associated with this effort

W83-70367 179-80-60

Marshall Space Flight Center, Huntsville, Ala

SOLIDIFICATION PROCESSES

J R Williams 205-453-5961

Control of the solidification of metal and alloys is keyed to gravitational effects such as buoyancy-driven convection. Thus, the objectives of the study are to (1) identify various aspects of solidification phenomena that may be affected by gravity-driven flows (2) devise and conduct critical experiments in both increased gravity as well as in space, and (3) impact the field of metallurgy by fundamental knowledge through devising better control strategies. Multicomponent metallic systems involve a first-to-freeze component which nucleates and begins to grow causing the composition ahead of the solidification front to change dramatically Where it is infeasible or undesirable to provide controlled gradients for a planar solidification front dendritic growth results. Thus, concentration is one of the more fundamental problems involved in the formation of dendrites. Directional solidification affords a degree of control because of unidirectional thermal gradient can be imposed and growth rate regulated. Another important class is the monotectic alloys which have a region of immiscibility. Finally nucleation and rapid solidification of deeply undercooled melts will be pursued by containerless melting and solidification

W83-70368 179-80-70 Marshall Space Flight Center, Huntsville Ala

CRYSTAL GROWTH PROCESSES

J R Williams 205-453-5961

In any crystal growth system, an important problem is that the

compositional and/or thermal fluctuations in the fluid phases cause compositional inhomogeneities and defects in the growing crystal. Where these fluctuations are caused by convection and sedimentation, they can be reduced in low gravity. Therefore, the major objectives of this crystal growth program are to (1) understand the role of gravity and determine limitations in Earth's gravity, (2) determine and demonstrate advantages to be obtained by growing crystals in space and (3) apply the findings to help solve problems in the growth of electronic and detector crystalline materials. The types of growth that will be explored in this program include melt, solution, vapor, and float zone growths Crystal growth by solidification from the melt is the most widely used technique for high technology single crystalline materials. The success of the technique depends on the control of the composition, temperature, and morphology of the solidification interface. Advantages of this technique include the control it provides over the temperature of growth and visocity. In the vapor approach, there are two distinct mechanisms for growing a crystal the physical vapor deposition and chemical vapor deposition. Finally, floating zone crystal growth is accomplished by supporting a polycrystalline rod at both ends, melting a portion of it with a moving heater and growing a crystal behind this

W83-70369

179-80-40

179-80-70

Langley Research Center Hampton, Va CRYSTAL GROWTH RESEARCH

R K Crouch 804-827-3535

The objective is to develop growth techniques and theories leading to improved bulk semiconductor single crystals that are required for future electronic device capabilities. Analytical studies and laboratory investigations will be conducted to define better the causes of crystalline defects such as voids, dislocations, grain boundaries, and inhomogeneities in these materials. Special emphasis will be placed on the effects of convection and on crystal growth in space

Solar Terrestrial and Astrophysics SR&T

W83-70370

188-38-51

Marshall Space Flight Center, Huntsville, Ala **DEVELOPMENT OF EXPERIMENTS AND HARDWARE FOR SOLAR** PHYSICS RESEARCH

M J Hagyard 205-453-0118

The objective of this program is to test a prototype of an instrument for a flight experiment to measure very small variations in total solar flux as a new technique for critical study of the dynamics of convection and magnetic fields in the solar convection zone. The approach is through development of an instrument a crystal cavity radiometer, which uses the extreme stability of oscillation of a quartz crystal as a sensitive indicator of changes in solar irradiance

W83-70371 188-38-51

Jet Propulsion Laboratory, Pasadena, Calif DEVELOPMENT OF EXPERIMENT AND HARDWARE

J H Underwood 213-354-7375

The ultimate objective of this program is to advance the physical understanding of the upper atmospheres - chromosphere, transition region and corona - of the Sun and solar-like stars. To this end, new instrumentation is being developed to image the Sun with ultrahigh spatial resolution in the soft X-ray and extreme ultraviolet (EUV) spectral regions (lambda < 300 A), and to improve spectroscopic measurements in this region in particular in the relatively unexplored band 25 A lambda < 170 A. This new instrumentation is based on the fabrication of X-ray/EUV reflectors by vacuum deposition. These reflectors, which may be viewed either as mirrors reflecting a specific band of wavelengths or as artificial crystals acting as Bragg diffractors, are composed of two materials arranged in ultra-thin alternating layers of uniform thickness The resulting periodic structure is exactly equivalent to a quarter-wave stack in ordinary optics and reflects X-rays according to the Bragg relation. With the new instruments it will be possible to make plasma diagnostic measurements with a spatial resolution much smaller than existing instrumentation allows. Hence it will be possible to study the size scale over which the dominant energy input and transport mechanisms in the upper solar atmosphere are effective. A prototype instrument will be developed for rocket flight under this task It is proposed to collaborate with Dr EC Bruner of Lockheed Palo Alto Research Laboratories to fly a small solar multilayer telescope as a piggy-back instrument on a Lockheed rocket. The telescope will obtain photographs in the coronal line of CVI at 33 7 A

188-38-51

Goddard Space Flight Center, Greenbelt, Md

DEVELOPMENT OF SOLAR EXPERIMENTS AND HARDWARE

Stuart D Jordan 301-344-6184

The objective of this RTOP is to develop scientific instruments which contribute to the solution of well-defined solar research problems These activities have the ultimate objective of flying payloads on problem-oriented missions. These research programs will form the bases for missions using the Shuttle or free fliers. One of these will be a study of coronal structures contributing to the solar wind and the interplanetary plasma. A second will be a study of the sources of high energy particles of the Sun, emphasizing instrumentation not accommodated by SMM and/or supplementary to the SMM instruments. All instruments will operate with the same temporal and spatial resolution to the maximum possible extent. The instruments considered for these payloads include the EUV and soft X-ray spectroheliographs and spectrographs for observation of structures in the corona and active regions with 1 arc sec spatial resolution and spectral resolution down to 10 mA and high resolution X-ray and gamma-ray telescopes In general support of the programs for instrument development is the investigation of critical optical components for ultraviolet and soft X-ray wavelength studies. This covers the design fabrication and testing of segments of surfaces of resolution and nonsymmetrical, aspheric surfaces for Wolter Type-II grazing incidence telescopes

W83-70373

188-38-52

Marshall Space Flight Center, Huntsville, Ala **GROUND-BASED OBSERVATIONS OF THE SUN** M J Hagyard 205-453-0118

(188-38-53)

The objective of this research is a program of ground-based observations for basic research concerning solar vector magnetic fields and for support of NASA solar missions using the facilities of the MSFC Solar Observatory In the program for basic research theoretical and observation programs are undertaken to study vector magnetic field structures which are relevant to current problems in solar physics. To support future NASA solar programs, techniques of observation and of data reduction and analysis are developed using the MSFC vector magnetograph such techniques will generate guidelines for operations of planned space-based magnetographs and will provide more focussed direction for the research performed with these instruments. Support of ongoing NASA solar missions is provided through daily observations, transmission of magnetograms to PI s and other relevant personnel, and through coordinated observing programs associated with collaborative investigations with mission PT s

W83-70374 188-38-52

Goddard Space Flight Center, Greenbelt Md **GROUND-BASED OBSERVATIONS OF THE SUN** J M Hollis 301-344-7591

The major objectives of this program are (1) to obtain and analyze observations of solar photographs (velocity and magnetic fields global oscillations and wave motion, coronal holes, active regions and flares, etc) at wavelengths observable from the ground which complement UV EUV X-ray and gamma-ray experiments on NASA flight missions such as the Solar Maximum Mission (SMM) (2) to support operational planning for spacecraft experiments, (3) to conduct basic research and develop specific instrumentation and observational progress relevant to objectives for future flight missions (4) to analyze comet tail photographs to determine the velocity field of the solar wind, and (5) to analyze comet-tail photographs to determine the three dimensional structure of interplanetary sector boundaries caused by the solar magnetic field The Vacuum Telescope at Kitt Peak National Observatory is supported by the Laboratory through its Southwest Solar Facility High-resolution, full-disk magnetograms and 10830A spectroheliographs are routinely obtained and substantial observing time is dedicated for special-purpose programs of spacecraft support and basic research by Laboratory staff

W83-70375 188-38-53

Marshall Space Flight Center, Huntsville Ala STRUCTURE AND EVOLUTION OF SOLAR MAGNETIC FIELDS (LABORATORY & THEORY FOR SOLAR PHYSICS)

R L Moore 205-453-0118

(188-38-52)

The basic empirical properties of solar magnetic fields and their effects in the solar atmosphere will be determined by analyzing MSFC vector magnetograms along with complementary data from other observatories and from SMM Observed effects will be interpreted with physical models. Electric current and magnetic energy in active regions will be studied to obtain the surface distribution of the vertical current, evidence for the distribution of current above the surface and estimates of the total magnetic energy and net Lorentz force. Magnetic

structure and evolution of active regions will be studied to determine how magnetic flux disappears from the surface of the Sun the field configurations in which flares occur and how these configurations form short-term magnetic evolution triggering flares, and magnetic structure and dynamic phenomena in sunspots. Magnetic transients in flares will be investigated to examine synchronism with impulsive energy release and the relation of photospheric magnetic changes to magnetic transient in chromosphere and corona in filament-eruption flares. Solar cycle studies will be investigated to examine further analysis of the poleward meridional flow and polar field injections inference of the operation of the solar cycle, and statistical properties of active regions. The study of fine-scale magnetic structure and activity in quiet regions will focus on ephemeral active regions and spicules and their relation to coronal heating, as well as the modeling of inhibition of heat conduction into transition region by magnetic construction

W83-70376 188-38-53

Goddard Space Flight Center, Greenbelt Md EXPERIMENT DEVELOPMENT - LABORATORY AND THEORETI-CAL SOLAR PHYSICS

Stuart D Jordan 301-344-6184

The primary objective is to support the laboratory's on-going programs by developing fundamental techniques for the interpretation of solar data. Specific goals include correctly interpreting the nature of observable solar phenomena by understanding fundamental spectroscopic processes, and understanding the flow of mass, energy and momentum from a mechanical energy reservoir such as the convection zone to the chromosphere and corona Focus will be on (1) the conversion of mechanical energy associated with the photospheric velocity fields into a nonthermal energy flux, (2) the propagation of this nonthermal energy from its point of generation within the photosphere to the chromosphere and corona, (3) the irreversible conversion of this energy into thermodynamic end products within the chromosphere and corona (4) the nuclear processes occuring in solar flares, observed in the gamma ray spectrum (5) consolidation of the above processes into models that predict new solar phenomena and explain those already observed and (6) the calculation of atomic transition probabilities and studies of atomic collision processes in solar plasmas

W83-70377 188-41-21

Marshall Space Flight Center Huntsville Ala GROUND-BASED OBSERVATIONS, UV AND OPTICAL AS-

G A Gary 205-453-0110

An observational and interpretive program of astronomical spectroscopy will be pursued using the Echelle grating nebular spectrograph This will include a program of observations and data interpretation concerning internal velocities in HII regions

W83-70378 188-41-22

Jet Propulsion Laboratory, Pasadena, Calif. GRAVITATIONAL WAVE ASTRONOMY AND COSMOLOGY

B Estabrook 213-354-3247

Under this RTOP, research will be conducted in three areas of general relativistic physics gravitation wave detection, cosmological background radiations, and theoretical problems in general relativity The first and major effort is the development of spacecraft Doppler detection of gravitational waves. In previous work, the primary noise problems for Doppler detection have been studied. One result was the identification of the most critical technological advance required a higher frequency (X-band) carrier signal for Doppler tracking. Concerted efforts to urge this development have followed, and we are now participating in its implementation at JPL Further investigations will be conducted to determine the best experimental techniques for gravitational wave detection and to quantify those non-plasma-induced noise problems which are likely to dominate when X-band tracking becomes a reality Data reduction techniques and objective filtering algorithms will be devised, based on our derivation of the response of Doppler links to incident gravitational waves. Past theoretical cosmology research led to a proposal from JPL for a microwave radiometer experiment which is incorporated in the forthcoming COBE mission. Sophisticated models of the evolution of the IGM were developed. The amounts of background radiation in a number of spectral regions are determined, and comparison with relevant COBE data will be used to discriminate acceptable evolutionary models. Two areas of theoretical research in nonlinear mathematics are proposed, related to understanding the sources and propagation of gravitational radiation. New mathematical techniques developed by the group will be applied to help elucidate the physics of rotating sources, and to search for gravitational wave 'solitons' discovery of such solitons would contribute to the understanding of wave propagation and would identify specific shapes of pulse signals to be detected in gravity wave experiments

188-41-24

W83-70383 Goddard Space Flight Center, Greenbelt, Md 188-46-56

Goddard Space Flight Center, Greenbelt, Md ULTRAVIOLET DETECTOR DEVELOPMENT D Weistrop 301-344-5781

The objective is the development of a photon-counting detector suitable for future space astronomy missions. The detector will be sensitive to far ultraviolet wavelengths, and have a large format and high resolution The design is exceedingly flexible, so that once the concept has been proved, future detectors can be optimized for particular missions. The detector to be built consists of an image converter/intensifier module fiber-optically coupled to a mosaic of charge coupled devices (CCD's) which provide a digital readout. The photocathode is deposited on the input side of a large microchannel plate (MCP) intensifier. The output from the MCP is proximity focussed onto a phosphor screen which is intagliated into the cores of a fiber-optic coupler. The coupler module consists of a 3 by 3 array of fiber-optic tapers, each of which is coupled to a single CCD. The CCD's are read out in parallel. A prototype consisting of a small MCP coupled with a single fiber-optics taper and CCD will be fabricated and tested. The experience gained in the prototype design and fabrication will be fed-back into the development program

W83-70380

188-41-51

Goddard Space Flight Center, Greenbelt, Md UV AND OPTICAL ASTRONOMY

A Boggess 301-344-5103

The objective is to pursue a long range program in astronomical research with emphasis on detector and instrumentation development, theoretical astrophysics relevant to the interpretation of space observations, and other specific topics of special interest to NASA. The effort includes operation of ground telescopes, evaluation of new instrumentation for potential space application, and development and evaluation of detector systems that are candidates for space flight. In the course of evaluating detectors and instruments, spectroscopic and photometric data are obtained from ground telescopes concerning the properties of stellar atmospheres, nebulae the interstellar medium, and galaxies Nonequilibrium model atmospheres are being investigated to interpret spectral observations from space observatories. Theoretical investigations are carried out regarding the formation and evolution of galaxies and on the evolution of stellar interiors, variable stars, novae, and planetary nebulae

188-41-53

Ames Research Center, Moffett Field, Calif THEORETICAL STUDIES OF GALAXIES, ACTIVE GALACTIC NUCLEI, AND QUASI STELLAR OBJECTS

L J Caroff 415-965-5536

The objective of this work is to conduct theoretical studies on important fundamental problems in the development of density inhomogeneities in the post-radiation dominated Universe and the subsequent formation and evolution of galaxies, and in the structure and dynamics of quasi stellar objects and active galactic nuclei. Much of the effort falls under the aegis of computational astrophysics, making use of existing numerical codes for hydrodynamics and radiative transfer as well as developing new ones. An important aspect of this area of study is the development of a general method for modeling random phenomena, which will have wide application to many areas of astrophysics

W83-70382

188-41-55

Goddard Space Flight Center, Greenbelt, Md INFRARED AND SUB-MILLIMETER ASTRONOMY M J Mumma 301-344-6994

(196-41-54 398-41-01, 154-50-80, 157-05-50)

The scientific objective of this program is to provide better understanding of the current state and evolution of astronomical objects This is achieved by observations at wavelengths from 1 micron to 1 mm and at spectral resolution (lambda/delta lambda) from 1 to 10 to the 7th power Since atmospheric opacity and emissivity prohibit or severely limit ground based observations at certain wavelengths (e.g. 4 to 8 and 13 to 700 microns), high altitude observational platforms such as the C-141, balloons, or satellites must be used. High sensitivity composite bolometers are being developed in the far infrared to take maximal advantage of low background conditions achievable at these altitudes. A balloon-borne 1.2m telescope is used to conduct a photometric survey of galactic sources of submillimeter radiation, and at least a partial survey of extragalactic sources at these wavelengths. An infrared sky camera is also used to quickly map various sources. Infrared and submillimeter coherent (heterodyne) spectrometers are developed and used to measure completely resolved intensity profiles for neutral and ionized molecular and atomic lines. Correlative studies are made-when possible to enable maximum insight into the physics of the medium

PARTICLE ASTROPHYSICS AND EXPERIMENT DEFINITION

F B McDonald 301-344-8801

The objective is to study the properties of the cosmic radiation in order to understand its origin and propagation, and to study the properties of the sites in which element synthesis and acceleration take place The particles observed are the nuclear and electronic species of the cosmic ray particles their energy spectra, their charge and isotopic composition, and their distribution in space. Some of these objectives can be met through the imaginative use of short duration observations on balloons and utilizing week-long observations on Spacelab Many heavier, larger-area payloads will require a space platform. Experiments which much be outside the magnetosphere can be done on Explorer class spacecraft. Supporting these objectives is both the development of new detector systems for studying the properties of solar and galactic cosmic rays and the associated development of theoretical studies relating to the sites, origin, models for acceleration, mechanisms for particles transport, etc., related to these experiments. The emphasis will be on studying the solar charge composition in the iron to uranium region, on precise measurements of isotopic abundances of solar and galactic cosmic rays, and to accurately determine the charge composition of galactic cosmic rays at the highest possible energies

W83-70384

188-46-57

Marshall Space Flight Center, Huntsville, Ala GAMMA RAY ASTRONOMY AND RELATED RESEARCH Gerald J Fishman 205-453-0117

An observational program in gamma ray astronomy and cosmic ray research is being pursued using balloon-borne experiments. Techniques and instrumentation for future spaceflight experiments are developed concurrently

W83-70385

188-46-57

Jet Propulsion Laboratory, Pasadena Calif **GAMMA-RAY ASTRONOMY**

A S Jacobson 213-354-6263

This RTOP describes the JPL program in X- and gamma-ray astronomy, part of which is carried out in close collaboration with the Space Radiation Laboratory on the CIT campus. The primary objective of the program is the development and application of instrumentation to observe gamma-ray line spectra in the energy range from 02 to 10 MeV from extraterrestrial objects. The scientific objectives are to obtain information on nucleosynthesis, galactic structure and the physical conditions in cosmic X-ray and gamma-ray sources, both constant and time-varying. The major effort under way is the development of a next generation balloon-borne instrument of significantly improved spectral and angular sensitivity. The specific objectives for FY-83 are to continue the design and fabrication of this new instrument and the development of improved gamma-ray sensor elements

W83-70386

188-46-57

Goddard Space Flight Center, Greenbelt, Md **GAMMA RAY ASTRONOMY**

C E Fichtel 301-344-6281

The technical objective is to develop the most appropriate detector system for the observation of the astrophysical sources of very energetic photons. The first approach was the development of a large high energy telescope using digitized spark chambers. Many major improvements to this basic telescope system are still being pursued and other approaches to detector systems are now being developed for the high energy, intermediate energy and low energy gamma-ray observations. In the medium energy interval (8 to 50 MeV), a second generation experiment has now been flown on a balloon. In the 1/2 to 40 MeV region different detection processes become dominant and hence, new detector techniques are required. A totally new detector is currently being built based on the Compton interaction process. In the 003 to 10 MeV region, much of the radiation may consist of monoenergetic line components, therefore, high resolution spectrometers also being developed which will be capable of sufficient precision to resolve lines as narrow as may be found in nature. In the high energy region improvements in the track imaging chamber systems are continuing, and special attention in the track imaging chamber research is now being directed towards drift chambers and larger spark chambers. At the same time, several approaches are being explored to improve angular resolution, including techniques to concentrate on higher energy photons Improved attitude and aspect systems are being built

188-46-59

Goddard Space Flight Center, Greenbelt, Md

X-RAY ASTRONOMY

E A Boldt 301-344-5853

Celestial X-ray sources have introduced us to rich new aspects of astronomy ranging from the millisecond bursts of hard X-rays coming from the innermost orbits of matter falling into a black-hole to the diffuse emission from extensive hot plasmas associated with clusters of galaxies. The combination of large sensitive area, low detector background, high temporal resolution and nondispersive spectroscopy over a broadband width has been the approach in discovering and exploring these phenomena The power of this approach has been well demonstrated Extending it with improved spectral resolution and broadband imaging is a major area of development now indicated. This involves the creation and evaluation of new systems incorporating low noise ionization counters of optimum resolution, large area X-ray concentrators and imaging devices

W83-70388

188-46-59

Marshall Space Flight Center, Huntsville, Ala

X-RAY ASTRONOMY

Martin C Weisskopf 205-453-5133

Research will be conducted in the field of X-ray astronomy in areas related to the Astrophysics programs of NASA Existing satellite and ground-based observations of the time variability of the X-ray sources and their optical counterparts will be analyzed and interpreted. Where applicable, auto-and cross-correlation techniques, shot model, and pulse-shape-innovation techniques will be utilized to determine the underlying pulse shape and stability as a function of time. An advanced X-ray polarimeter will be designed, built, tested, and flown in a sounding rocket The polarimeter will utilize the polarization dependence of the photoelectric effect and, in particular, the angular dependence of certain fluorescence photons on the linear polarization of the incidence X-rays

W83-70389

188-46-59

Jet Propulsion Laboratory, Pasadena, Calif.

X-RAY ASTRONOMY CCD INSTRUMENTATION DEVELOPMENT S Jacobson 213-354-6263

Recent tests have demonstrated that virtual-phase, charge-coupled devices (CCDs) have high spatial resolution, moderate spectral resolution, and high detection efficiency for single X-ray photons. The objective of this RTOP is to develop a CCD-based imaging X-ray spectrometer for X-ray astronomy observations, and to use this instrumentation to study the temperature and abundance distributions as well as the state of ionization of cosmic X-ray sources. Using a CCD detector of the type which is available now, a spectrometer will be developed, tested, calibrated, and used at the focal plane of a rocket-borne, grazing incidence telescope A parallel detector development program will optimize CCD properties which are required for operation at the focus of advanced grazing-incidence X-ray telescopes

W83-70390

188-78-38

Jet Propulsion Laboratory, Pasadena, Calif STARPROBE - ADVANCED TECHNOLOGY MANAGEMENT & PLANNING

J E Randolph 213-354-2732

This RTOP covers funding for the STARPROBE advanced technology management and planning program in FY-83 to maintain cognizance over the advanced technology support provided by NASA-OAST The objectives of the FY-83 STARPROBE program are to (1) maintain the liaison between JPL and NASA-ARC in the development of the thermal shield for the STARPROBE mission, (2) develop a test plan for the shield materials testing in the spring of 1983 at the CNRS solar furnace, (3) work with the ARC contractor in developing the test samples, fixtures, and data analysis plans, and (4) continue the long term STARPROBE planning by completing a new advanced technology plan and a new program plan and schedule A small cadre of part-time personnel will continue the technology liaison with ARC and assist in the preparation of test plans and future program plans

W83-70391

188-78-38

Marshall Space Flight Center, Huntsville, Ala

ADVANCED MISSION STUDY - SOLAR X-RAY PINHOLE SATELLITE AND LONG FOCAL LENGTH CORONAGRAPH

J R Dabbs 205-453-3430

Hard X-ray imaging (10 keV to 100 keV) from solar flares will contribute not only to knowledge of the sources directly associated with the chromospheric manifestations of flares, but will also help in exploring the corona. A solution to the problem of achieving significantly better angular resolution for hard X-rays lies in the 'Pinhole Experiment' concept. An equally important use of the Pinhole satellite will be its application as an external occulter for coronagraph observations of the

solar corona. Previous feasibility studies investigated alternative stabilization techniques and preliminary optical systems design for a long focal length coronagraph which will be flown on a Spacelab mission utilizing a boom deployed occulting and aperture mask. Separations on the order of 50 meters could afford subarc-second X-ray imaging of the Sun and also provide highly effective occultation experiments in both visible and UV regions. The Spacelab facility is expected to mature into longer focal length facilities either adjunct to the Space Platform or as separate freeflyers

W83-70392

188-78-41

Marshall Space Flight Center, Huntsville, Ala

GRAVITY PROBE - B

K Neighbors 205-453-1232

The scientific goal of Gravity Probe-B is to confirm Einstein's general theory of relativity. This is to be accomplished by measuring gyroscopic precession in a free-flying spacecraft in polar orbit about the Earth This project involves complimentary efforts at MSFC, Stanford University, and the University of Alabama in Huntsville. The work is a coordinated theoretical, experimental and engineering program with the definition phase (Phase B) begun in FY-81 and development phase (Phase C/D) to start in FY-84 with a launch in FY-93 The GP-B is planned as an In-House MSFC project with the instrument to be developed by a Stanford University-managed contractor

W83-70393

188-78-51

Goddard Space Flight Center, Greenbelt, Md

ADVANCED TECHNOLOGICAL DEVELOPMENT, GENERAL SIGNAL AND DATA PROCESSING ELECTRONICS; SOLID STATE **DETECTORS**

E Stilwell 301-344-6454

The objectives of this research project are to develop and test new onboard signal handling, processing, storage, computing and auxiliary circuitry for use in energetic particle and astrophysics experiments on spacecraft, rockets, balloons, etc., as well as special test and analysis equipment applicable for both ground and Shuttle usage. The growing complexity of experiments and the corresponding increase in the volume of data obtained have made signal handling, data processing and data transmission capability-limiting factors. To reduce the transmission of unnecessary data, it is necessary to increase the experiment's on-board signal handling and data processing capability. This program is approached through the investigation and development of new techniques for signal shaping and handling, data processing and auxiliary circuitry, as well as the modification of existing techniques using advanced technology and materials, including MOS/LSI technology, thick film techniques, multiple chip techniques, and microprocessors. The technical objective of the research project is to conduct a program of research and development, and device test and evaluation of silicon and germanium nuclear radiation detectors with emphasis on (1) the improvement of detector technology, (2) the understanding of the radiation and chemical damage effects on device operation and lifetime, (3) the establishment of technology for the fabrication of specialized devices not available from industry, and (4) continued pragmatic life testing

Planetary Astronomy

W83-70394

196-41-50

Goddard Space Flight Center, Greenbelt, Md GROUND-BASED INFRARED ASTRONOMY V G Kunde 301-344-5693

(188-41-55, 154-50-80)

The scientific objective is to determine spectra resolution groundbased measurements in the intermediate infrared, information on astrophysical objects, such as molecular clouds, interstellar lines, molecular and circumstellar components in stellar atmospheres, and planetary atmospheres A spectrometer system employing a cryogenic Michelson interferometer (77K) is being developed to meet the simultaneous requirements of high spectral resolution, a wide free spectral and range and high sensitivity. An optical retardation up to 25 cm will provide an unapodized spectral resolution up to 02/cm in the 400 to 2000/cm range A post-dispersed detection system is being developed to reduce background noise from a warm telescope system and the atmosphere at the detector, thus allowing the multiplex advantage of the interferometer to be retained. The cooled instrumentation with the post-dispersed detection system, operating at a favorable infrared site, will allow maximum sensitivity to be attained for an interferometer system at a ground-based site. The sensitivity level for a measurement in the 1000/cm (10 micrometers) region with a 122 cm diameter telescope, an integration time of 60 minutes and a spectral resolution of 0 2/cm is approximately 5 x 10 to the -26th power watts/sq m/hz The S/N level for Jupiter

in the 1000/cm region with the above system is approximately 7 for one minute integration time and full spectral resolution of 0.02/cm Initial observations will be made during FY-83 with the low spectral resolution post-dispersion system at the KPNO FTS

W83-70395

196-41-52

Goddard Space Flight Center, Greenbelt, Md IMAGING STUDIES OF COMETS John C Brandt 301-344-8701

This RTOP provides for the operation of a small high altitude observatory, Joint Observatory for Cometary Research (JOCR), for imaging research on comets and their interactions with solar radiation and the solar wind. This research is carried out with ground-based images alone or if suitable data from spacecraft such as Solar Polar Mission is available, with an appropriate combination of ground-based and in situ measurements. It should be noted that funding under this RTOP provides support for the operation of the observatory only analysis of research results is funded by the interested Program Office In addition, when suitable bright comets appear radio observations will be made at existing national facilities, and other visible wavelength observations will be carried out at other suitable facilities. The observatory site in central New Mexico is one of the darkest sites left in the continental U.S. Extensive photography of comets Kohoutek, Kobayashi-Berger-Milon and West has been carried out. These photographs show extensive features in the plasma tail 0.1 au from the head which have been analyzed for phase speed and estimates of the tail magnetic field. We convincingly associated a structure in comet Kohoutek on January 20, 1974, with a specific excursion in the polar solar-wind speed, this is a first. In addition, disconnection events (DEs) of the plasma tail have been convincingly shown to result from sector boundary crossings and magnetic reconnection

W83-70396

196-41-54

Goddard Space Flight Center, Greenbelt, Md ADVANCED INFRARED ASTRONOMY AND LABORATORY **ASTROPHYSICS**

Michael J Mumma 301-344-6994

(188-41-55 154-50-80)

The objective of the advanced infrared astronomy program are to study the molecular constituents of solar system objects (e.g., planetary atmospheres and comets) through observations of their IR line spectra, and so to further knowledge about (1) molecular abundances, (2) kinetic, vibrational, and rotational temperature distributions (3) kinetic velocity shifts (winds), (4) vertical and spatial distributions, and (5) ambient gas densities, and to carry out comparative studies of these objects. The physical information sought is contained in the intensity profiles of isolated spectral lines and can be obtained by inversion of the observed line shapes The measurement of spectral line shapes has recently become a tractable problem at IR wavelengths, and line shapes can now be measured by infrared heterodyne spectroscopy. The approach is to develop and employ coherent detection line receivers for use in the infrared wavelength regions. The infrared optics incorporate either gas lasers or semiconductor diode lasers as local oscillators and HgCdTe photo-mixers The intermediate frequency signal is fed into a GSFC standard spectral line receiver which analyzes, displays and outputs the spectral lines Initial observations with this system have been from the ground, but it has been developed with an eye toward flights on the NASA C-141 and in space Laboratory work on precise line frequency determinations and on pressure broadening effects is also carried out in support of the field experiment

W83-70397

196.41.67

Ames Research Center, Moffett Field Calif PLANETARY ASTRONOMY AND SUPPORTING LABORATORY RESEARCH

R W Boese 415-965-5510

The composition of planetary atmospheres and surface and the abundance, temperature and pressure of certain atmospheric constituents can be determined by spectroscopic observations from ground-based and from airborne observatories. Such data are necessary for the preparation of valid model atmospheres, which are needed to evaluate the possibilities of life on the planets and to design systems for exploratory missions and for the preparation of evolutionary models of planetary interiors. The objectives of this work are to obtain, study and analyze spectroscopic observations of the planets and their satellites, to obtain and analyze, in the laboratory, spectra appropriate for valid interpretation of planetary observations, and to develop the analytical and computational techniques necessary to interpret planetary spectra in terms of real planetary atmospheres and surfaces. The objectives will be pursued by measuring, in the laboratory, basic molecular parameters such as absorption line and band intensities band modeling parameters, absorption line half-widths, vibration-rotation interaction constants, and line pressure induced shifts and absorption. The dependence of these parameters on pressure and temperature will be obtained by using long path gas cells. cooled gas cells and high resolution spectrometers and interferometers operating primarily in the infrared Spectra of the planets and their satellites will be obtained by using airborne and ground-based telescopes and will be analyzed to obtain information about the composition and structure of their atmosphere and the compositon of their surface

W83-70398

Ames Research Center, Moffett Field, Calif **DETECTION OF OTHER PLANETARY SYSTEMS**

C Black 415-965-5495

The long range objective of this activity is to develop a comprehensive program to detect other planetary systems. The near term objectives include the funding of selected University researchers to pursue modest exploratory developmental and observational programs as well as theoretical studies directed at identifying optimum techniques for ground-based planetary detection systems. The choice of University researchers will be based on a peer review of unsolicited proposals, and it will be guided by the basic recommendations set forth in Volume 1 of NASA CP-2124 Funding will also be used to support in-house theoretical research at Ames Research Center related to the detection and study of other planetary systems

W83-70399

196-41-71

Jet Propulsion Laboratory, Pasadena, Calif OPTICAL ASTRONOMY

V Johnson 213-354-7427

The objective of the ground-based optical astronomy task is to study planets and their satellites, by means of ground-based observations, at visible and near-infrared wavelengths (approximately 0.3 to 2.0 microns) This task consists of (1) investigating the physical and chemical properties of the upper tropospheres of Venus, Jupiter Saturn, Uranus, and Neptune through high resolution astronomical spectroscopy and spectrophotometry. (2) investigating the physical state and bulk motions of the neutral sodium cloud associated with lo, through a variety of advanced high resolution spectroscopic techniques, and investigating the temporal and spatial behavior of the Na D-line emission from the Jovian satellite lo (J-1) through a synoptic program of spectroscopic observations, and (3) making comprehensive observations through Fabry-Perot spectroscopy and CCD images of the visible and near infrared emissions from trapped ions in the Jovian magnetosphere, leading to a detailed description of the evolution and physical characteristics of the Jupiter/lo S2 - S3 nebula. The ground-based optical astronomy task also provides limited operational support (equipment maintenance and setup, observing assistance) at Table Mountain Observatory (TMO) to programs supported from other sources. The principal program supported in this manner is the asteroid dynamics task under the supervision of A. Harris (JPL)

W83-70400

196-41-73

Jet Propulsion Laboratory, Pasadena, Calif RADIO ASTRONOMY

M J Klein 213-354-6160

The long range goals of this task are to develop observation strategies and state-of-the-art receiver systems for the investigation of solar system objects in the submillimeter spectral region. The submillimeter spectral region is virtually unexplored, and NASA is currently considering a space telescope (LDR) to close the existing gap between the millimeter and far infrared spectral regions. This task supports the long range goals of the LDR Space Telescope Strong rotational transitions of many important atmospheric molecules populate this largely unexplored spectral region and the potential for planetary spectroscopy is very promising Observation strategies and techniques will be developed to explore this potential by designing and carrying out specific experiments in the millimeter and submillimeter spectral range. Specific objects to be observed will include comets and planets. On the instrumentation side, the specific objectives are to design and construct state-of-the-art receiver systems for millimeter and submillimeter observations made from high altitude sites, aircraft and eventually from space. Associated digital systems are also constructed and maintained. The specific ongoing work of this task is the development of a 600 GHz heterodyne receiver and a 300 GHz cooled mixer receiver

W83-70401

196-41-75

Jet Propulsion Laboratory, Pasadena, Calif COMETS

R L Newburn Jr 213-354-2319

Once the perihelion of any cometary orbit lies among the planets. brought there perhaps by stellar perturbations, the orbit begins to evolve rapidly compared to the age of the solar system. Once the perihelion reaches 3 to 5 AU, the comet begins to change physically with great rapidity, typically becoming an inert, degassed body after 1000 revolutions

Physical activity changes the orbit and orbital changes alter the physical activity. The objectives are to investigate the dynamics and orbital evolution of several periodic comets and their end products, their attendant meteor streams, and to maintain a continuing program of ground based physical observations of comets and the interpretation of these observations, giving emphasis to a quantitative understanding of the physical processes which give rise to the phenomena of nucleus, coma and tails. The intent is to intercompare many comets in order to enhance the value of data taken on those few that become targets for space missions. Ground based observations will be carried out at Mauna Kea Lick and other observatories using the best auxiliary equipment available at each An investigation will be continued of the dynamics and orbital evolution of several periodic comets and their attendant meteor streams. The obvious nongravitational forces affecting the motions of comets will be modeled by assuming these forces are due to the rocket effect of outgassing cometary ices. Once the astrometric cometary observations for each comet have been used to refine the existing nongravitational force model, the cometary nucleus spin direction, spin axis evolution and nuclear ice volatility can be inferred. For those comets with associated meteor showers, the meteor shower data will be used to characterize the dust distribution in the neighborhood of the parent comet

W83-70402

196-41-76

Jet Propulsion Laboratory Pasadena, Calif ASTEROIDS

D L Matson 213-354-2984

The objective is to understand asteroids their origin, compositions, relations to other planets, satellites and comets and to study any hazards they pose to mankind through impacts on the Earth. This task supports telescope observations and the determination of orbits and ephemerides for faint asteroids and newly discovered objects. The objectives for FY-83 are to continue observations of faint asteroids and comets. The spectral reflectances of asteroids are measured. This allows the classification of asteroids by parameters which are related to composition and size. In the coming year photometry at wavelengths of 056, 12 16 and 22 microns will be carried out for selected asteroids. Objects of special opportunity or interest will be studied by CVF spectrophotometry and photometry at 3 5 4 8 10 and 21 microns The dynamical evolution of the asteroid belt and rings of the outer planets will be studied. The existence of periodic motion of these systems will be examined and long term predictions of future evolution will be provided A search program is designed to discover new members of the Apollo, Amor and Aten asteroid groups. All of these objects must be discovered on their close approaches to the Earth. They are so small that at other times they are not locatable even with large telescopes

W83-70403

196-41-77

Jet Propulsion Laboratory, Pasadena, Calif PLANETARY INFRARED IMAGING

R J Terrile 213-354-6158

The objective is to provide high spatial resolution, ground-based infrared and visible images and spectra of the Jupiter Saturn, Uranus and Neptune systems. These data directly support instrumentation on the Voyager mission to Jupiter, Saturn Uranus and Neptune and the proposed Galileo mission to Juniter Juniter will be observed in the 5 micron window into the deep atmosphere as a continuation of a very successful program to monitor Jovian weather patterns throughout the Voyager postencounter period. Saturn will be observed at various infrared wavelengths in order to determine if atmospheric features seen from the ground can be correlated with those observed by Voyager instruments Ground-based observations will be combined with Voyager imaging science and infrared interferometer spectrometer (IRIS) data Imaging data collected with a CCD coronagraph at 8900 A and scan data in the infrared at 2.2 microns will allow detailed observations of Saturn's E-ring and provide ground-based information on Jupiter's newly discovered ring and satellite 1979 JI This same CCD system will be used to observe the newly discovered satellites of Saturn and to conduct satellite searches around Uranus and Neptune Several comets will also be studied in the visible and infrared including a search for comet Halley and observations designed to determine the albedo and size of the nucleus Observations will be made with an existing infrared imaging system at the Hale 5-meter telescope at 1 to 5, 8 to 14 and 20 microns and scans will be acquired at the 3-meter NASA IRTF at Mauna Kea Observatory Also, CCD images will be acquired from the Palomar 5-meter and 15-meter telescopes using an existing camera and data analysis facility at Caltech Uranus and Neptune satellite searches will be conducted from the du Pont 25 meter telescope at Las Campanas Observatory in

Life Sciences SR&T

W83-70404

199-10-00

Lyndon B Johnson Space Center Houston Tex INFLIGHT MEDICAL SUPPORT

James S Logan 713-483-4021

The objective is to evolve in a progressive manner an in-flight medical support capability for use in the STS and Space Operations Center era which will provide the following medical support functions (1) crew health mantenance (2) laboratory capability (3) therapeutic intervention (4) emergency resuscritation and life support, and (5) data management. An in-flight medical support capability will be developed Requirements for in-flight medical support of a long duration manned space station must be identified. They will be derived from four major areas (1) previous medical in-flight experience (2) projected medical scenarios having a small but finite probability of occurrence (3) mission related spacecraft and environmental hazards and (4) health maintenance and preventive medicine. Medical procedures such as CPR and routine blood and sample handling must be evaluated and modified for a microgravity environment.

W83-70405

199-10-11

Lyndon B Johnson Space Center Houston Tex OPERATIONAL LABORATORY SUPPORT

W H Shumate 713-483-4461

The objective is to provide medical operations support by the Johnson Space Center to approved Agency programs. The medical operations support includes the conduct of studies to investigate countermeasures to physiological changes which occur when man is exposed to the spaceflight environment clinical laboratory support of astronaut health programs pre-and postflight testing of astronauts and, operational tests and studies of the spacecraft environment, life support equipment, habitability systems, medical procedures, and support equipment. Discipline oriented laboratories will be maintained in each of the physiological problem areas.

W83-70406

199-10-12

Ames Research Center Moffett Field Calif OPERATIONAL LABORATORY H Sandler 415-965-5745 (199-10-11)

The objective is to provide support for the operation and maintenance of Ames Research Center facilities utilized in the performance of research within the Operational Medicine Program Funds will be utilized to operate and maintain the Human Research Facility Human Centrifuge, VAX computer Water Immersion Facility, and for the payment of test subjects and support service contractors

W83-70407

199-10-21

Lyndon B Johnson Space Center Houston, Tex MEDICAL OPERATIONS LONGITUDINAL STUDIES Sam L Pool 713-483-4461

The objective of the research covered by this RTOP is to conduct longitudinal retrospective and prospective studies of the medical data on the US astronauts some of whom have flown in space, and a control group of JSC civil servants matched 4.1 on the basis of age, sex race, and education. The studies covered involve individuals in a closed population in an attempt to relate changes in physiology and/or pathology to specific factors associated with individual traits of the astronauts and occupational exposure. Areas of study and of particular interest consist of acute responses and long term adaptative mechanisms to weightlessness variations in demonstrated performance during structured, complex psychomotor tasks and, finally the effects if any of the occupational exposures to health outcome, including physiological alterations, aging, and disease/disorder incidence

W83-70408

199-10-22

Ames Research Center, Moffett Field Calif LONGITUDINAL STUDIES
H Sandler 415-965-5745
(199-10-21)

The objectives are (1) to obtain analyze and evaluate echocardiograms obtained from humans during simulated weightlessness (2) to investigate the effects of age and gender on the ability to withstand simulated Shuttle reentry G levels, and (3) to evaluate anti-G suits as a protective measure during simulated Shuttle reentry stresses. Male and female human subjects of different ages will be subjected to bed rest as a means of simulating weightlessness and inducing the physiological deconditioning associated with spaceflight Echocardiograms will be obtained before, during and after bed rest to assess the effects of hypokinesia on the heart.

Lyndon B Johnson Space Center Houston, Tex CREW HEALTH MAINTENANCE

James S Logan 713-483-4021

Maintenance of space crew health is a primary objective of the manned spaceflight program. This RTOP is designed to provide guidance procedures and equipment to achieve this objective both now and in the distant future. Furthermore, a strict modular approach will be followed, thereby assuring a timely growth pattern for hardware development and deminishing the tendency toward sudden obsolescence of an entire system because of one subunit's inadequacy. The concept of health maintenance can be dissected in the following way disease prevention, disease diagnosis and disease treatment. The tasks contained within this RTOP are directed toward one or more of these concepts

W83-70410

199-10-32

199-10-31

Ames Research Center, Moffett Field, Calif CREW HEALTH MAINTENANCE H Sandler 415-965-4745 (199-10-31)

This RTOP proposes to conduct research directed towards maintaining crew health during spaceflight. Specific research objectives are (1) to identify and evaluate pharmacologic countermeasures for cardiovascular deconditioning during spaceflight (2) to evaluate preflight exercise training as a potential countermeasure for physiological deconditioning experienced during spaceflight and (3) to compare weightlessness simulation techniques and actual preflight, inflight and postflight biomedical data. Human subjects will be subjected to bedrest and water immersion as a means of simulating the physiological deconditioning which occurs during spaceflight. Responses of exercisetrained and sedentary individuals to these simulations will be compared Techniques such as echocardiography, LBNP ergometry, and Doppler blood flow monitoring will all be utilized in support of the research

W83-70411

199-10-41

Lyndon B Johnson Space Center, Houston Tex SYSTEMS HABITABILITY VERIFICATION James M Waligora 713-483-5457

A large portion of biomedical research conducted as part of the Space Program has to do with the effect of space specific environments on man and other organisms. What may be less obvious as a potential problem is that the environment that man is exposed to in space is almost entirely a man made environment. Man environmental factors that are relatively constant in the Earth's atmosphere such as O2 and CO2 concentration and pressure must be carefully controlled by environmental control systems in the space vehicle. Acceptable control ranges and emergency ranges for environmental factors must be specified and it must be verified that the spacecraft can maintain the environment within these specifications. The specifications must provide for the safety and well being of the crew and must also provide an environment stable enough to allow biomedical study of the space-unique environmental factors. In arriving at specifications for these environmental factors, considerations must be given to the difficulty involved in controlling a given environmental factor within a given control range and the implications in terms of cost weight, and reliability Defining these limits and verification that the limits are met in the spacecraft will require research in several specific areas

W83-70412

199-20-11

Lyndon B Johnson Space Center, Houston, Tex CARDIOVASCULAR DECONDITIONING (JSC)

M W Bungo 713-483-5457

The overall goal of this program is an understanding of the cardiovascular changes (termed Cardiovascular Deconditioning') which occur with space flight and their impact on crewmembers. Specific aims are to (1) define the underlying mechanisms of cardiovascular deconditioning (2) provide appropriate countermeasures for these effects (3) develop systems to aid in the accomplishment of these goals, and (4) apply the results of the preceding in an operational sense for selection, retention, and health maintenance of future space travelers Ground based studies on both human and animal subjects will in part utilize (1) provocative techniques such as exercise testing and lower body negative pressure, (2) bedrest studies as an analogous condition to weightlessness, (3) noninvasive and invasive cardiovascular monitoring, and (4) pharmacologic interventions, all in an effort to accomplish the goals set forth above. Direct inflight applications or continued research will be the continuum Impact will be greater access to the space environment for more diverse segments of the population under a greater variety of conditions

W83-70413

199-20-12

Ames Research Center, Moffett Field, Calif CARDIOVASCULAR DECONDITIONING

H Sandler 415-965-5745

(199-20-11 199-20-13, 199-20-14)

The overall goal of this program is an understanding of the cardiovascular changes that regularly occur with space flight Specific aims are to define the underlying mechanisms of cardiovascular deconditioning, to determine whether specific cardiovascular risks occur with short and long term weightlessness exposure, to develop appropriate countermeasures for observed changes and to develop and implement appropriate space flight experiments. To accomplish these goals, ground based studies on both human and animal subjects will be carried out Specific activities will include (1) immobilization (body casting) in animal models (2) determination of the effects of exercise training (3) the use of provocative orthostatic stress tests such as centrifugation, change in body position (tilt) and water immersion, and (4) tests of procedures, devices and drugs to prevent and counteract deconditioning. Results should lead to (1) a better understanding of the mechanisms of cardiovascular deconditioning (2) better devices and procedures for modifying deconditioning effects, and (3) specific space flight experiments as an understanding of the risks attendant with space flight Impact will be greatly improved flight safety, access of a broader segment of the population to space flight, and use of the weightless environment to expand our understanding of cardiovascular function

W83-70414

199-20-21

Lyndon B Johnson Space Center Houston Tex SPACE MOTION SICKNESS

J L Homick 713-483-5457

This RTOP has three primary objectives (1) to elucidate the etiology of the space motion sickness syndrome, (2) to develop methods for accurately identifying prior to flight, individuals susceptible to space sickness and (3) to develop effective and acceptable methods for the prevention and treatment of this syndrome A broad based program of interrelated studies will be undertaken. Emphasis will be placed on human research Etiological research will be directed toward neurophysiological and behavioral investigations of vestibular proprioceptive and visual function and their interactions. Investigations of other sensory systems and physiological functions, spatial orientation and postural control mechanisms will be included to the extent that they may yield information critical to explaining the etiology of space sickness. The development of predictors will focus on the establishment of correlations between various vestibular function, motion sickness susceptibility, behavioral and biochemical measurements. Detailed evaluations of sensory and physiological adaptation processes as well as various pharmacological substances will be key elements in studies designed to develop countermeasures Throughout the course of implementing this program of research a wide variety of unique hardware devices will be employed which provide required controlled angular and linear accelerations as well as visual, proprioceptive and somatosensory stimulation. Parabolic flight experiments will be included to the extent possible

W83-70415 199-20-22

Ames Research Center, Moffett Field Calif BASIC MECHANISMS UNDERLYING SPACE MOTION SICK-NESS

N G Daunton 415-965-6245 (199-20-21)

Space motion sickness is a serious problem in manned space flight when astronauts are required to move around and perform complex tasks during the first 3 to 5 days in 0-g. During the time that symptoms are experienced, astronauts do not operate at optimal efficiency The objectives of this RTOP are to determine the cause(s) and underlying basic mechanisms of space sickness and to develop methods to predict, prevent, and treat it. To accomplish these objectives, a broad based program of interrelated psychophysical neurophysiological, biochemical and neuroanatomical studies on human and animal subjects will be undertaken. These studies will be directed primarily toward determining the role of vestibular visual, and proprioceptive systems and their interactions and the role of biochemical factors in the development of motion and space sickness and in the maintenance of orientation and postural control in abnormal motion environments. The symptomatology of motion and space sickness will be studied and the effects of the adaptation process and of various pharmaceutical agents on this symptomatology will be determined. Studies will be undertaken to identify neurotransmitters and other biochemical factors involved in motion and space sickness. Hypotheses about the etiology of, and possible countermeasures for, space sickness will be developed from ground based research. Flight experiments will be used to test hypotheses and validate suggested countermeasures

199-20-31

Lyndon B Johnson Space Center, Houston, Tex BONE LOSS

S I Altchuler 713-483-4086

(199-20-41)

Changes in calcium metabolism and losses of bone mineral have been observed in crewmen exposed to weightless space flight. The basis of these changes and the underlying mechanisms are not known, nor are the consequences of the alterations which may exist in crewmen during long duration missions understood. The goals of this RTOP are to provide ground based research into the mechanisms of the alterations, assessment of the changes in ground based model systems, development of the methods to assess the changes more accurately by noninvasive methods, and then to coordinate these results into the development of countermeasures for the deleterious skeletal changes which occur in crewmen The approach used will be to conduct clinical studies and studies in model systems to determine the precise nature of the changes and the underlying alterations producing these changes biochemical endocrinological, and physical alterations will be studied Correlations will be performed between hormonal and nutritional alterations, and the measured changes in skeletal status and in calcium metabolism

W83-70417

199-20-32

Ames Research Center, Moffett Field, Calif **BONE ALTERATIONS**

D R Young 415-965-5549

(199-20-31 199-20-34)

Losses of bone mineral have been observed in crew members exposed to weightless space flight. The basis and the underlying mechanisms of the alteration is not known and the consequences for passengers and crew members in future long duration space flight have not been assessed The goals of this RTOP are to clarify the mechanisms producing skeletal alterations in hypodynamic environments to determine the remedial measures for the prevention of alterations, to develop noninvasive measures of skeletal status and assist in the development of operational quidelines for crew safety. Solution of the problem of bone alterations will be based upon identification of the physiologic mechanisms, the severity of the problem and determination of the extent and manner in which those changes are reversible. Animal models will be studied for an in-depth analysis of bone mass loss in ground based simulations of hypogravic environments. The studies will emphasize investigations of mechanisms of bone formation rate, bone resorption rate, and related metabolic events as influenced by the acceleration environment Noninvasive measures of skeletal status will be developed. Preventative countermeasures will be investigated. Human studies will be performed to develop a data base for evaluating noninvasive measures of bone stiffness for the assessment of risk factors associated with bone mass loss

W83-70418 Lyndon B Johnson Space Center, Houston, Tex MUSCLE ALTERATIONS N M Cintron-Trevino 713-483-4086 (199-20-31)

The regulation of muscle integrity and function during space flight and the causes of its apparent atrophy are the central questions addressed by the present research program. It intends as its overall research goals to elucidate and define the mechanisms and biochemical factors operative in the processes associated with muscle metabolism and atrophy during weightlessness and to develop effective countermeasures to these muscle alterations in order to optimize man's performance and recovery upon return to a one-g environment. Using animal models, studies to define the molecular mechanisms underlying muscle mass regulation and atrophy will focus on the dynamics, enzyme systems, and effectors of protein and carbohydrate metabolism, the chemical bioenergetics, membrane dynamics, and mechanics of contractile function, and the role of motor activity and hormonal influence in the maintenance of muscle function. Preventive and remedial countermeasures will center primarily around the influence of exercise on muscle integrity corollary studies will determine the type and quantity of exercise required to curtail the progression of the induced atrophy process

W83-70419

199-20-42

199-20-41

Ames Research Center, Moffett Field, Calif MUSCLE ATROPHY S Ellis 415-965-5757

(199-20-41)

The overall aims of this research program are to determine the underlying causes for the muscle atrophy problem observed in both humans and animals in space and to develop suitable measures to counter these undesirable changes. Specific objectives consist of (1) conducting basic studies into the nature of the biochemical and

physiological mechanisms which regulate skeletal muscle mass and properties (2) developing and validating methods for monitoring the rate of atrophy of skeletal muscle in human subjects and laboratory animals, and (3) investigating possible countermeasures which may forestall muscle atrophy induced by disuse and weightlessness. Muscle atrophy will be achieved in experimental animals principally by immobilization with casts and in some instances, by suspension hypokinesia. In special circumstances denervation, tenotomy, and in some instances, castration will be used to produce atrophy in specific muscles or to evaluate the effects of innervation. Since the degree of active or passive tension of a muscle has been shown to play an important role in the development of atrophy this factor will also be examined and controlled in the above models. In pursuit of an understanding of the mechanism by which muscle atrophy develops the approaches to be used are principally biochemical and physiological

W83-70420

199-20-51

199-20-52

199-20-61

Lyndon B Johnson Space Center Houston Tex

BLOOD ALTERATIONS (INFLUENCE OF SPACE FLIGHT ON THE **BLOOD AND BLOOD FORMING TISSUES)**

Gerald R Taylor 713-483-4086

(199-20-60)

The most significant effects of the space flight environment on the blood and blood forming tissues in man have been a postflight reduction in the blastogenic transformability of lymphocytes, a marked lymphocytopenia granulocytosis and a consistent reduction in the circulating erythrocyte mass. The variations in the magnitude of the loss in individual crewmen and the complicated postflight recovery kinetics suggest a complex relationship between the red cell mass loss and the duration of the exposure to space flight conditions. This anemia of space flight' was frequently accompanied by a reduction in plasma volume apparently occurring early in the mission and sustained throughout the flight Other, more subtle effects have been observed with respect to the function and structure of red blood cells and in the concentration of some plasma proteins. The alterations observed within the leukocyte population appear to result from at least two distinct phenomena both of which must be thoroughly studied. Postflight changes in the coagulation mechanism have not yet been shown. This research program seeks to determine the significance of the reported changes and to determine their medical significance, if any

W83-70421 Ames Research Center, Moffett Field, Calif BLOOD ALTERATIONS

H A Leon 415-965-5359 (199-20-51, 199-20-54)

A decrease in the red blood cell (RBC) mass has been a common finding in human space flights Recent US and USSR flights show that this loss can occur in the absence of hyperoxia. While it is likely that the decrease is due in part to a decreased production evidence suggests that weightlessness can induce hemolysis in rats. Also, the RBC membrane changes noted in Skylab suggest that hemolysis may occur in astronauts also since membrane alterations are often a prerequisite for sequestration and hemolysis. The significance of these studies is that hemolysis in weightlessness appears to be an early occurrence. The major objective of these studies is to elucidate these hemolytic mechanisms. These studies will contribute to an understanding of pathological hemolytic disorders. Mammals exposed to high altitude develop an increased RBC mass. Rats experience a transient but significant hemolysis upon return to sea level air. It is felt that this is a convenient and realistic model for at least a portion of the mechanisms which cause hemolysis in weightlessness. Also the RBC membrane will be specifically studied in certain well defined experimental systems

W83-70422 Lyndon B Johnson Space Center Houston, Tex FLUID AND ELECTROLYTE CHANGE

Carolyn S Leach 713-483-4086

(199-20-10, 199-20-30 199-20-50)

Body fluid compartment shift occurs in early exposure to weightlessness. These changes are complicated by losses in electrolytes (sodium, potassium calcium, phosphorus, magnesium and chloride) occurring at a slower rate over mission duration which further influence fluid distribution. Hormonal responses are elicited to counteract these changes The purpose of this program will be to study these changes and their effect on man's (astronaut and nonastronaut) ability to function in space Results of the investigations in this RTOP will provide an understanding of the physiological and biochemical effects of weightlessness and rationale for nutritional and/or other countermeasures for use in future space flight missions. The information gained from exposure of man to weightlessness flight for periods approaching three months has shown that fluid and electrolyte metabolism has been altered in all crewmen

studied It is apparent that the changes experienced are multiphasic and are caused not only by the weightless environment but also by conditions related to the preparation for flight, the activity during flight, and the recovery procedures

W83-70423

199-20-62

Ames Research Center, Moffett Field Calif FLUID AND ELECTROLYTE CHANGES L C Keil 415-965-6378

(199-20-61)

The primary objective of this RTOP is to investigate and characterize the physiological mechanism(s) responsible for in-flight changes in fluid/electrolyte metabolism. Once the mechanism is known appropriate administration of dietary or hormonal agents during flight may be used to restore or prevent excessive fluid/electrolyte loss To investigate the fluid/electrolyte mechanism affected by headward fluid shifts, data will be obtained from horizontal and head-down human bed rest studies. These data will be analyzed and compared to that generated in animals subjected to similar episodes of blood redistribution in an effort to define the responsible mechanism(s)

W83.70424

199-20-71

Lyndon B Johnson Space Center, Houston, Tex RADIATION EFFECTS AND PROTECTION

D S Nachtwey 713-483-5281
This RTOP describes a long term program of research to determine the nature of the space ionizing radiation environment and its consequences for manned space operations. While currently available information is sufficient for early Shuttle missions, research priorities of the attached program are based on the assumption that NASA's long term plans will involve men in geostationary orbit before the year 2000 Based on knowledge obtained from previous research under this RTOP, exposure to ionizing radiation may be the limiting factor in both mission duration and total career for the crew. Furthermore, shielding considerations, especially for protection from solar particle events, may influence significantly the detailed design and total mass of a spacecraft. To provide timely solutions to these problems in the mission planning stage, the underlying research must be conducted now A plan is presented for research in specific areas of radiobiology and radiation dosimetry Specific attention is given to the effects of high energy particles of space since the problem is unique to NASA. A nonfunded coordination effort with other NASA RTOP's and programs of related government agencies will augment the information required by NASA in its long term radiation research effort

W83-70425

199-20-72

Ames Research Center, Moffett Field, Calif BIOLOGICAL EFFECTS OF PARTICLE RADIATION D E Philpott 415-965-5218 (199-20-71, 199-20-76)

This program is designed to assure human safety in space operations with respect to the radiation risk factor posed by high energy particles (HZEs) The objectives of the research program are to determine (1) short term and long term effects of HZE particles on cells and organs (2) threshold of exposure for long term effects which would be deleterious to normal functions, e.g., vision and behavior, (3) cancer risk and effects on the rate of CNS aging following HZE exposure Experimental animals will be exposed to HZE particles at the Lawrence Berkeley Laboratory or other suitable facility Damage in the retina, brain, and other organs at varying intervals after irradiation will be determined by pathological, morphological, biochemical, and physiological methods Data will be acquired on dividing and nondividing cells in response to low dose HZE's Life span studies will be conducted in animals following low dose irradiation and the rate of aging in selected organs and tissues will be determined by light and electron microscopy and cytochemical techniques. Animals will received gross and microscopic examination and the results compared to radiation modality and dose The dose required for biological changes will be related to that required by X-rays to produce the same alterations A ratio, or RBE greater than 1 represents the increased human risk factor

W83-70426

199-20-76

Langley Research Center, Hampton, Va **RADIATION EFFECTS AND PROTECTION**

P F Holloway 804-827-2893

The objectives of this research are to provide basic radiation protection data and analytical methods for use in assessing optimum dosimetry requirements, human performance factors, impact on mission objectives, and anticipated exposures in various body tissues as input to radiobiological studies (especially in connection with high energy heavy ions) Particular attention will be given to calculating buildup factors for protons, developing multilayered electron environmental data for human protection

problems, evaluating self shielding factors, and analyzing protection requirements in Earth orbit as input to mission planning exercises. The Langley Research Center will maintain a basic research effort in this area Both the needed expertise and computer facilities required are available at LaRC. New analytical methods will be developed for radiation transport which are amendable to mission analysis, and for use in shield optimization procedures. Theoretical models of the nuclear reaction of heavy ions are being developed, and complementary experiments are being performed in cooperation with the DOE Extensive reviews and evaluations of existing reaction data and calculational techniques. The development of the necessary reaction data base and calculational models must precede the application to specific NASA programs

W83.70427

199-20-82

Ames Research Center, Moffett Field, Calif **HUMAN BEHAVIOR AND PERFORMANCE**

R M Patton 415-965-6602

Manned space missions require high levels of human performance in unfamiliar and stressful environments. Future missions will involve crewmembers, scientist passengers (chosen for their scientific and technical expertise, and not trained as career astronauts) and ultimately people from the population at large Because of the high cost of these missions, and the high value of their successful completion, every effort must be made to maximize the probability of successful performance and adjustment to mission conditions by all crewmembers and passengers. This research will (1) develop selection, training and performance monitoring procedures that are appropriate to crews involved in manned space missions, (2) study task oriented groups in order to specify the best structure and composition of groups engaged in manned space missions, (3) study human response to the stresses of spaceflight in order to develop procedures to prevent performance decrements and to remedy those that do occur. Both laboratory studies and field studies on earth, which simulate conditions of long duration manned spaceflight will be undertaken to identify the personal, group, procedural and situational characteristics predictive of effective or ineffective performance. and to develop preventive and remedial measures that may be employed in order to counter possible performance decrements

W83-70428

199-20-92

Ames Research Center, Moffett Field, Calif GENERAL BIOMEDICAL RESEARCH A D Mandel 415-965-5061

The main objective of this RTOP is to provide a research program to support preliminary studies in areas not specifically covered by any of the major problem oriented RTOP's If the results of preliminary studies prove to be relevant and of interest to the overall goals and objectives of the biomedical research program, the research will be transferred to one of the major RTOP's for a more thorough study Research within this RTOP presently focuses on studies of (1) infectious disease detection, (2) thermoregulation, (3) neurotransmitter control, and (4) carbohydrate metabolism. This program will examine the ability of certain blood components to respond to an infectious agent, and to determine whether or not an individual is in the prodromal stage of an infectious disease. Studies will be done in order to determine whether the presence of certain serum components can be used to predict the ability of an individual to react normally to an infection and whether weightlessness can affect immune responsiveness. Understanding of body temperature regulation by the central nervous system will be extended by studies to determine active central nervous system sites during pyrogen induced fever. Studies will continue on the mechanism of regulation and control of neurotransmitters, especially the role of dietary factors. Elements which are concerned with the regulation of carbohydrate metabolism, especially high glucose and saturated fat diets will also be investigated

W83-70429

199-30-07

Goddard Space Flight Center, Greenbelt Md MONITORING LARGE SCALE TOTAL PRIMARY PRODUCTION AND DESERTIFICATION PROCESSES WITH AVHRR IMAGERY J Tucker 301-344-7122

The objectives of this RTOP are (1) to produce a spectrallyderived from advanced very high resolution radiometer (AVHRR) data total dry matter accumulation map of African Sahel and Sudan vegetation zones between approximately 10 N to 20 N across entire width of Africa for the 1982 rainy season, and (2) study selected areas in semiarid environments where concern over desertification is focused (i.e., Mauritania, Mali, Lake Chad area, Sudan, Saudi Arabia, Pakistan, and India) and determine the utility of AVHRR imagery for monitoring these processes The AVHRR GAC (4km) data will be used for the Sahel-Sudan total dry matter study while AVHRR LAC (1km) data will be used for the desertification studies Research conducted at NASA/GSFC in FY-82

has demonstrated the practicality of both of these undertakings. Close cooperation will be maintained with UN/FAO and UN/UNEP groups working in the respective study areas

W83-70430

199-30-31

Lyndon B Johnson Space Center, Houston, Tex GLOBAL ECOLOGY

D Stuart Nachtwey 713-483-5281

The ultimate goal of a global ecology program is to quantitatively understand (i.e. mathematically model) the interrelationships of the Earth's entire biota and the entire lithosphere-hydrosphere-atmosphere system. Some of the elements required for this understanding have been outlined in some detail in reports from two workshops, 'Interaction of the Biota with the Atmosphere and Sediments' (Oct. 1979, Washington, DC) and 'Life from a Planetary Perspective Fundamental Issues in Global Ecology' (Summer, 1980, Santa Barbara, CA) At the simplest level, the elements of global ecology consist of the biogeochemical reservoirs of the atmosphere, hydrosphere, lithosphere, and the biota, the fluxes of biogeochemicals between the reservoirs (sources and sinks), and the feedback interactions of the flow of biogeochemicals with each other and with solar radiation. It has become clear that purturbations of the balance of flows of specific chemical compounds between reservoirs can lead to significant alterations of the entire interrelated earth system (e.g. anthropogenic CO2 increase can yield climate change, increases in methane, chlorofluorocarbons, and nitrogen oxides can yield ozone layer change accompanied by solar ultraviolet change)

W83-70431

199-30-36

Langley Research Center, Hampton, Va

BIOSPHERE ATMOSPHERE INTERACTIONS IN WETLAND **ECOSYSTEMS**

R C Harriss 804-827-3645

The research plan consists of two elements the first of which concerns the biogenic modulation of methane in global troposphere, the role of wetlands. Wetlands are hypothesized to be the major natural source of methane to the troposphere Primary objectives in this research include (1) a detailed investigation of microbiological, ecological, geochemical, and physical factors controlling methane emissions from soil and water interfaces to the atmosphere in the great Dismal Swamp, Virginia, will be conducted, (2) methane emissions will be quantified at a wide variety, of swamp, salt-marsh, and peat bog sites in eastern North America, (3) these studies of methane flux in specific habitats will be coupled to remote sensing measurements of ecosystem properties to develop capabilities for extrapolation of in situ measurements to regional and global biogeochemical fluxes. The second element concerns remote sensing or ecological assessment of tidal wetlands The proposed research effort will explore the application of multispectral radiance measurements to assessment of biogenic mediation of the global carbon cycle by tidal wetlands

W83-70432

199-40-22

Ames Research Center, Moffett Field, Calif

DEVELOPMENTAL BIOLOGY

J Miguel 415-965-5952

The objective of the research described in this RTOP is to identify the effects of gravity and space radiation on plant, insect, and animal development, maturation and senescence, and to examine the evolutionary importance of gravity as a determinant of the function and form of terrestrial life. The approach is to evaluate through ground based and spaceflight experiments, the dependence of plant, insect, and animal growth and development on gravity, to assess and understand the mechanisms involved in the effects of gravity and ionizing radiation on the growth, reproduction, development and aging of living forms, and, to evolve concepts, design experiments and establish baseline data for future inflight fundamental research

W83-70433

199-40-32

Ames Research Center, Moffett Field, Calif **BIOLOGICAL ADAPTATION**

E M Holton 415-965-5471

(199-40-10, 199-40-20)

The overall aims of this research program are to increase our understanding of biological processes as they are affected by the unique environment of space, to identify and assess the biological mechanisms by which living systems respond and adapt to space flight environmental parameters (particularly altered gravity) as well as the interactive affects of gravity and other stimuli and stresses on the physiology and metabolism of organisms, and to determine functional variations and regulating mechanisms at all levels of biologic organization (plants, invertebrates, and vertebrates) using gravity as a tool to yield new understanding about living systems on Earth Biochemical, physiological, and anatomical changes in organisms exposed to altered

gravity will be delineated and quantified. Altered gravity states will be introduced by means of simulated weightlessness (Holton model and modifications), acceleration (centrifuge) or clinostats. Morphologic changes, modified biochemical pathways, and changes in specific physiological functions will be assessed in terms of exposure intensity and duration a significant part of this effort will elaborate on the regulatory factors in homeostatic adaptation to and deconditioning from the metabolic stress associated with a change in the gravity field

W83-70434

199-50-12

Ames Research Center, Moffett Field, Calif CHEMICAL EVOLUTION

H P Klein 415-965-5094 (199-50-32, 199-50-42)

The aim of this research is to understand the origins and chemical evolutionary pathways of organic matter in the cosmos which led, in the case of the Earth, to the emergence of life but which, in extraterrestrial environments, may have taken divergent paths. Chemical evolution research encompasses the study of the evolutionary path of carbon and its compounds from the primal fireball, through interstellar clouds, to formation of solar systems, to the beginnings of life on Earth In experiments conducted under conditions designed to simulate the putative environments of cooling solar nebulae, cometary heads and tails, and primitive and contemporary planetary atmospheres and surfaces, the extent and nature of abiotic synthesis of organic matter are determined Natural evidence bearing on the validity and generality of the chemical evolution hypothesis is sought through organic and inorganic analyses of materials having extraterrestrial (e.g., meteorites, lunar samples, interstellar dust grains, Martian soil) and ancient and recent terrestrial origin. The intimate association of minerals with organic matter everywhere in the cosmos and their necessary cogenesis and coevolution make it essential to understand the influences of one on the other From comparative planetological studies and the study of the organic geochemistry, mineralogy, and petrology of natural samples will come an understanding of the factors that have influenced the course of chemical evolution on planetary bodies and the origin and early evolution of life on Earth

W83-70435

199-50-22

Ames Research Center, Moffett Field, Calif **ORGANIC GEOCHEMISTRY**

H P Klein 415-965-5094

(199-50-12, 199-50-32 199-50-52) The objective of this RTOP is to understand the origin and early evolution of life on Earth through studies of organic matter in ancient rocks, contemporary environments, and microorganisms. The approach will be to (1) examine stable carbon and nitrogen isotopic fractionation in microbial metabolism, (2) using this knowledge, investigate isotopic fractionation in biogeochemically significant microorganisms in order to learn how they impose their chemical and isotopic signatures upon the organic constituents of rocks, and (3) through field studies, relate these signatures in contemporary environments to their analogs in ancient fossils and sediments

W83-70436

199-50-32

Ames Research Center, Moffett Field, Calif ORIGIN AND EVOLUTION OF LIFE H P Klein 415-965-5094 (199-50-12, 199-50-42)

The objectives of this research are (1) to explore the mechanisms, processes, and environments associated with the origin(s) and evolution of life on Earth and to ascertain to what extent they represent constraints within which life can develop elsewhere in the Universe. (2) to utilize such information to design models lending themselves to experimental verification. The origin of life represents a point on a conceptual continuum that characterizes the physical, chemical, and biological evolution of matter While experimental verification of hypotheses concerned with cosmological and chemical evolution can be carried out on the extraterrestrial stage, studies on the origin and evolution of life are limited to the only experimental material available, terrestrial life. Several crucial areas of study have been identified for extensive investigation from which first principles can be discerned and applied to the formulation of a theory for the origin and early evolution of life. Two approaches are adopted for studying biogenesis and bioevolution one is to posit plausible models for relevant processes and environments, and test them either experimentally or by the use of computer simulations, the other is to identify early events and their evolutionary context in comtemporary organisms since they are, in fact, repositories of information concerning what took place during the evolution of life

W83-70437 Ames Research Center, Moffett Field, Calif SOLAR SYSTEM ENVIRONMENTS H P Klein 415-965-5094 (199-50-12, 199-50-22)

The aim of this RTOP is to provide specific information on the chemical composition of the atmospheres and the volatiles in surface and particulate matter of solar system bodies including planets, their satellites, comets, asteroids, meteorites and particulate matter in space This information is essential for selecting or devising the most appropriate model for the evolution of the solar system and for each of the investigated bodies, and will further provide a basis for understanding the conditions necessary for the origin of life by comparisons of the evolutions and the chemistries of these bodies. Improved methods and instrumentation will be developed for in situ chemical analyses of the volatile species contained in atmospheres, surfaces and particulates Special emphasis is directed to the development of the gas chromatographic approach since it is now proven to be among the most effective means for measuring complex gaseous chemical mixtures. Improvements in the gas chromatography, such as column technology, detector design, and total system design (including work on other subsystems), will be rigorously explored

W83-70438 Ames Research Center, Moffett Field, Calif LIFE IN THE UNIVERSE H P Klein 415-965-5094 (199-50-12, 199-50-22, 199-50-32)

The objectives are to understand the history of the biogenic elements in the galaxy, in the solar system, and during the early evolution of the Earth to study possible evolutionary pathways for complex life in the Universe and particularly, to examine the influence of astrophysical, stellar and solar system events on the evolution of complex life on Earth This RTOP has two distinct parts the history of the biogenic elements, and the evolution of complex life in each part a series of science workshops is being convened to explore the major scientific questions, to determine which are amenable to theoretical, experimental or observational approaches and to recommend the major elements of a technical plan to pursue those objectives. The recommendations of the workshops will then be incorporated into proposals for Agency program plans for the History of the Biogenic Elements and for the Evolution of Complex Life, each to be an element of the Life in the Universe program Each area will include some preliminary tasks which will assist in the crystallization of program plans or which are cogent examples of the type of research appropriate for the two areas. As detailed program plans are defined in each area over the next two fiscal years, FY-83 and FY-84, it may be appropriate to split this RTOP into its two major components

W83-70439 199-50-62

Ames Research Center, Moffett Field, Calif THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE H P Klein 415-965-5094

This RTOP supports the development and implementation of the SETI element of the NASA OSSA Life Sciences Division program entitled 'Life in the Universe' The SETI program is a research and development effort which has the following five objectives (1) to conduct an extensive 5-year research and development effort to determine the most cost effective way to do SETI and to carry out limited but significant SETI observations, (2) to design build and test a SETI breadboard system (3) to use the breadboard at Goldstone and Arecibo for initial SETI observations (4) to evaluate the SETI system for its value for radio astronomy, and (5) to explore new technologies for SETI In accomplishing these objectives, telescope SETI hardware interfaces will be determined, alternative observational techniques investigated, and various signal processing and identification methods examined in software and optimized for implementation in hardware. Signals of natural and artificial origin will be sought over portions of the sky between 1 and 10 GHz up to a maximum sensitivity of 10 to the -23rd power/sq Wm, and selected solar-type stars will be searched in portions of the 1 to 3 GHz range up to a maximum sensitivity of 10 to the 27th power/sq Wm These initial observations are expected to continue through 1987 The plan is divided into four breadboard phases, each of which improves the breadboard capability

W83-70440 Lyndon B Johnson Space Center, Houston, Tex

ADVANCED LIFE SUPPORT SYSTEMS

Richard L Sauer 713-483-2759

The objective of this program is to identify the requirements and to develop the technology that will be required to provide the metabolic support systems for the next generation, long duration, manned space missions. These metabolic support systems include atmosphere revitalization and control, water reclamation and supply, hygiene and waste management, and food service and supply. This RTOP covers the research, development and testing needed to support the eventual design and fabrication of the flight metabolic support systems. This RTOP will include the effort required to support the development of the metabolic support systems for a long term orbital space vehicle, and in many instances, will culminate with the fabrication and testing of flight prototype hardware. Following system concept identification, technology gaps and needs will be identified to permit timely investigation and solution. It is to this and the accompanying development of subsystem concepts, procedures, and developmental hardware that the initial effort will be directed. This early effort will provide for alternate and potentially more efficient but less developed concepts where technical trade offs indicate a potential overall benefit to the program through decreased expendable, weight or volume requirements, increased reliability and maintainability, and increased crew acceptability and performance

Ames Research Center, Moffett Field, Calif ADVANCED LIFE SUPPORT SYSTEMS H P Klein 415-965-5094

(199-60-22)

199-50-42

199-50-52

The objective of this program is to advance the technology base for regenerative life support systems required to support long term manned space missions. The regenerative life support processes must provide a more complete system closure (reduction of expendables). The subsystem functions to be investigated and developed include the following air revitalization, atmospheric supply and composition control, water reclamation, and waste management systems. Specific life support subsystem technology areas will be investigated (feasibility and/or development) and subsystem concept designs will be generated. This RTOP will be directed toward advancing the technology and/or hardware development status for advanced life support subsystems, and will result in achieving a technology base (research and hardware development) for subsystems that have the characteristics of low maintenance, high reliability and long life

199-60-12

199-60-22

W83-70442 199-60-21 Lyndon B Johnson Space Center, Houston, Tex ADVANCED EXTRAVEHICULAR SYSTEMS (SPACE SUIT)

Richard E Mayo 713-483-4933 The objective of this RTOP is to develop the technology necessary

to provide a high mobility, nonventing extravehicular system (space suit and life support) that will maximize the utility for EVA for servicing Shuttle scientific payloads and for support of EVA for servicing Shuttle scientific payloads and for support of advanced activities such as space station construction. There will be active coordination with the OSTS RTOP effort for prebreathe elimination to insure maximum transfer of technology between the two efforts. To this end, maximum use will be made of existing hardware interfaces to facilitate near-term use of a higher operating pressure EVA system Competitive solutions for high mobility space suit elements/assemblies will be pursued

W83-70443 Ames Research Center, Moffett Field, Calif ADVANCED EXTRAVEHICULAR SYSTEMS H P Klein 415-965-5094 (199-60-12)

The objective of this RTOP is to advance the technology base for advanced extravehicular systems required to support manned space missions. The advanced extravehicular systems must provide for extended EVA capability This RTOP program will emphasize improved hardware performance, increased hardware and system life, and reduced EVA equipment and payload design, manufacturing, maintenance, and operations costs. The technology areas associated with protection of an EVA astronaut will be pursued under this RTOP. This includes development of efficient high pressure (approximately > 8 psig) suit components that provide for greater mobility and the development of concepts for passive thermal control

W83-70444 199-60-42 Ames Research Center, Moffett Field, Calif FOOD REQUIREMENTS, PRODUCTION AND PROCESSING FOR H P Klein 415-965-5094

(199-60-52)

199-60-11

The objective of this program is to investigate various methods of utilizing processed waste materials to regenerate food in a controlled environment life support system (CELSS) Methods of food production that could be employed in controlled environments will be investigated These include photosynthesis by organisms ranging from algae to higher plants, and physicochemical methods, such as photoreduction of CO2 in the latter case, reduced organics could be fed to non-photosynthetic organisms, such as yeast and bacteria, which could be used as human food materials after appropriate processing During the early phases of the program, investigation of higher plants will be emphasized Research will be concentrated on plant nutrient requirements, stability and reliability of production, including toxin production and characterization, controllability of growth, and variation in food nutrient value Plants will be selected and evaluated through growth and product analyses in a simulated CELSS environment Plant production techniques will be tested in a simulated CELSS environment in conjunction with waste management and systems management developments

W83.70445

199-60-52

Ames Research Center, Moffett Field, Calif WASTE MANAGEMENT FOR CELSS

H P Klein 415-965-5094

The objective is to plan and conduct the research and develop the technology required to process wastes so as to produce the nutrients necessary for regenerating food in a controlled ecological life support system (CELSS) for space applications Models of the waste materials to be processed by the waste management system in a CELSS for use in space will be developed Exploratory studies will be undertaken of each of the major waste management technologies that have been identified to date as candidates for CELSS. The candidate methods are wet oxidation, incineration, aerobic and anaerobic biological oxidation Emphasis in the exploratory studies will be placed on determining the adaptability of a given waste management method to producing a product that can be used subsequently to regenerate food. Inherent in this approach is investigation of methods to remove and separate organic and mineral components of the effluent.

W83-70446

199-60-62

Ames Research Center, Moffett Field, Calif.

SYSTEMS MANAGEMENT, CONTROL, AND ECOLOGICAL CONSIDERATIONS FOR CELSS

H P Klein 415-965-5094 (199-60-42, 199-60-52)

The objectives are (1) to identify and investigate biological functions in isolated autonomous systems (CELSS) that must be controlled to achieve stable system operation, (2) to identify and investigate control parameters in biological, chemical and mechanical systems, as well as identify parameter coupling and develop control strategies, and (3) to establish and maintain communication and cooperation among investigators in the CELSS Program The approach used in this RTOP is to develop theoretical and/or experimental investigations of significant problems affecting CELSS system operation, control and stability in addition, because this work intersects other CELSS investigations in the areas of food production (199-60-42) and waste management (199-60-52), certain tasks address problems of promoting an integrated CELSS Research Program, and supporting continuous communication between program investigators and program managers

W83-70447

199-60-71

Lyndon B Johnson Space Center, Houston, Tex
MAN-MACHINE ENGINEERING REQUIREMENTS FOR DATA AND
FUNCTIONAL INTERFACES

J L Lewis 713-483-4966

To move toward quantification of man-machine engineering data, both on the ground and in flight. To continue to pursue state-of-the-art technology and to advance that technology for the purpose of creating more effective and efficient man-machine interfaces for manned spacecraft. To improve techniques of man-machine engineering design so that innovative steps may be taken toward creating better crew interfaces in future vehicles. To implement a series of continuing tasks to identify and implement workable instrumentation packages for acquiring quantitative man-machine engineering data in one-g, simulated, zero-g, and actual zero-g. To continue those efforts currently defined that lead toward definitive design requirements for use as inputs to the Design Performance Lab. To pursue feasibility studies of promising new crew interface items.

W83-70448

199-70-12

Ames Research Center, Moffett Field, Calif COSMOS FLIGHT EXPERIMENTS PROJECT

E W Gomersall 415-965-5730

The objectives of this RTOP are (1) to determine the effects of spaceflight on a wide range of biological specimens. (2) to use hypogravity as a tool to study fundamental problems in biology which cannot be solved on the ground. (3) to study biomedical problems encountered during manned spaceflight using animal surrogates. (4) to evaluate

countermeasures to the deleterious effects of spaceflight, (5) to develop and test life sciences equipment and experimental procedures which could be used to support the flight of similar equipment and experiments aboard the US Space Shuttle, and (6) to stimulate an exchange between US and USSR scientists of information related to spaceflight Following a Soviet invitation to participate in a spaceflight mission, a dear colleague letter is prepared and released Experiment proposals are reviewed and a tentative US payload submitted to the Soviets for approval Experiments selected for flight are funded for a definition phase preflight and a postflight data analysis phase Flight and ground support hardware are developed and tested Final reports are prepared and published

W83-70449

199-70-32

Ames Research Center, Moffett Field, Calif

SAMPLE BANK

W E Berry 415-965-5736

The overall objective of this program is to provide a means of increasing the scientific yield from the Spacelab 4 flight by allowing more investigators access to the unclaimed tissue of flight animals and to proceed with simple investigations which will not impact the primary selected studies already approved for the flight. Use of this tissue is intended to also complement on-going SR and T programs. The specific objective is to request additional tests from the investigator community, including those investigators whose experiments are already selected for this flight. The program will be initiated by utilizing input from the investigators selected for Spacelab 4 in a colloquium or as a splinter session of one of the investigator working group meetings. Additional suggestions will be requested from all of the investigations currently affiliated with the NASA Life Sciences Program (SR&T) and other University researchers After this contingent has had an opportunity to suggest additional measurements and investigations, it may be possible to open the sample bank program to other reseachers via a simple announcement or 'Dear Colleague' letter A NASA group will review and select the appropriate new studies from the suggestions and will allow as many additional measurements on the flight animals as is deemed reasonable and prudent. This concept is dependent, of course, on the total funding available

W83-70450

199-80-31

Lyndon B Johnson Space Center, Houston, Tex ADVANCED EQUIPMENT DEVELOPMENT

R L Frost 713-483-5991

The development of prototype hardware in support of both operational medical investigations during Shuttle flights and possible life sciences experiments during Spacelab flights will be accomplished by this RTOP. The hardware will be designed with flexibility in mind to allow the conduct of several similar investigations. This RTOP will provide for design studies, development of prototype hardware for testing and detailed design specifications or flight hardware. Contracts will be let to consolidate requirements and develop design requirements for hardware optimized to support several investigations. Prototype hardware will be procured and evaluations conducted to optimize the design. Detailed design specifications will be prepared to support procurement of flight hardware.

W83-70451

199-80-32

Ames Research Center, Moffett Field, Calif
VESTIBULAR RESEARCH FACILITY (VRF)/VARIABLE GRAVITY
RESEARCH FACILITY (VGRF)

R W Mah 415-965-6538

Current theories are that the vestibular system is intimately involved with space motion sickness, as it is with motion sickness A fundamental understanding of the vestibular system is necessary before a satisfactory prevention or cure can be derived. Emphasis is placed on fundamental research using animal test subjects, which will enable scientists to conduct investigations not feasible for human subjects The need for a variable gravity research centrifuge in space is well documented Emphasis is placed on studies to define the requirements for providing 1-g control capability in space and for conducting gravitational research in space. Based on scientific conclusions reached by the 1979 International Vestibular Meeting and the 1980 Vestibular Meeting (both chaired by Dr. M. Ross), a ground version of the vestibular research facility (VRF) will be developed for conducting vestibular research Construction of ground science hardware will be completed and will be housed in a functional VRF science facility. This ground equipment includes many, but not all, of the stimulus and recording modes of the flight version. The Science Advisory Committee for VRF feels that this ground equipment presents a unique opportunity for animal and potentially human research concerning vestibular function. This facility will be available for the scientific community to use as described in the VRF scientific research program plan. The variable gravity research facility design parameters will be developed through ground tests and the hardware

capability will be developed as an add-on module to the VRF core modules

W83-70452

DEFINITION

199-80-42

Ames Research Center, Moffett Field, Calif

LONG DURATION LIFE SCIENCES SATELLITE PROGRAM

E W Gomersall 415-965-5730

The objective of this work is to identify science issues, experiment requirements and the technology, subsystem, system, and operational requirements involved in the conduct of non-human, biological research on spaceflights of long duration. The current limitation of the time-in-orbit of the Space Transportation System and the Spacelab may not permit a careful and unequivocal resolution of the various biological problems which confront man and other living organisms on spaceflights of long duration Those questions need to be addressed to provide safe and reliable manned flights for extended periods of time. In-house studies to identify life science questions and experiment scenarios will be used as a working basis for review by the science community and as inputs to in-house and contracted assessments of future spaceborne research equipment A science advisory team will be appointed In-house and contracted studies will be conducted to develop conceptual experiment equipment, assess critical technology requirements, development of spacecraft system descriptions and tradeoffs

W83-70453

199-80-48

Marshall Space Flight Center, Huntsville, Ala LIFE SCIENCES PAYLOAD ACCOMMODATIONS J D Hilchey 205-453-3430

(199-80-42)

The objective of this research is to conduct conceptual design studies of accommodating and integrating life sciences facilities for long duration research on non-human test subjects aboard space platforms in order to (1) determine the feasibility of accommodating and integrating such facilities aboard platforms, (2) provide the engineering data, cost estimates and schedules necessary to plan the development of such accommodations and integration capabilities, and (3) synthesize results from a number of parallel studies into a data base to support decisions whether to proceed with a Phase B effort A group of interrelated in-house and contracted study activities includes (1) two parallel, competitively procured, contracted system conceptual design and feasibility studies to provide accommodations and integration conceptual designs, interface engineering data, and programmatics for life sciences research facilities aboard platforms, (2) similar in-house activities extending the pre-phase A work accomplished in FY-81, and (3) in-house synthesis of the accommodation and integration system study results to provide the basis for deciding the Phase B course of action

W83-70454

199-80-52

Ames Research Center, Moffett Field, Calif LARGE PRIMATE FACILITY

E Berry 415-965-5736

The objectives of this RTOP are (1) to obtain scientific guidance for the conceptual design and development of a large primate facility which can be used in the Spacelab and long duration missions, (2) to develop a set of design requirements for a large primate facility, (3) to evolve and evaluate flight hardware systems concepts. A science advisory group will be convened to identify science requirements for a large primate facility. The set of requirements agreed upon by the advisory group will be used to shape design concepts. Conceptual system designs will be evaluated by the advisory group Prototypes of the selected system concepts will be fabricated and tested using procedures suggested by the advisory group

W83-70455

199-80-62

Ames Research Center, Moffett Field, Calif MAMMALIAN DEVELOPMENT FACILITY

W E Berry 415-965-5736

The aims of this research are (1) to provide scientific guidance for the conceptual design and development of a mammalian development facility (MDF) to study early mammalian development (i.e., from fertilization to litter development in micro-gravity environments), (2) to identify design requirements for an MDF and (3) to evolve and evaluate flight hardware concepts. A science advisory group will be convened to identify science requirements for an MDF to support mammalian development experiments in space. The set of requirements agreed upon by the advisory group will be used to establish design concepts for an MDF Conceptual designs will be evaluated by the advisory group Prototypes will be fabricated and tested using procedures suggested by the advisory group

W83-70456

199-90-71

Lyndon B Johnson Space Center, Houston, Tex INTERDISCIPLINARY RESEARCH

Lawrence F Dietlein 713-483-6291

The life sciences directorate at Johnson Space Center is responsible for the development of a comprehensive biomedical research program in support of manned space flight "This broad, multidiscipline mandate to acquire new knowledge is directed toward the acquisition of definitive data regarding the effects of the space environment on life systems in order to define the critical physiological and psychological variables which must be integrated into the overall considerations of spacecraft designers and mission planners. The objective of the interdisciplinary research RTOP is to provide flexibility in the accomplishment of this goal. The responsibility for planning, implementing, and continually evaluating the life sciences programs at Johnson includes the need to provide support for preliminary investigation of various alternative advanced research and technology efforts which might ultimately become part of an approved programmed RTOP assigned to the center. An aggressive and responsive attention to alternative advanced programs requires that the center director for life sciences have some autonomous discretion in the pursuit of tentative investigations

W83-70457

199-90-72

Ames Research Center, Moffett Field, Calif AMES RESEARCH CENTER INITIATIVES

H P Klein 415-965-5094

The mission of the life sciences directorate at Ames Research Center (ARC) is to understand the origin of life on Earth and to search for life elsewhere in the universe, to understand the effects of space flight upon humans and other forms, and to provide environments and equipment in spacecraft that will permit crews and passengers to exist safely and perform effectively. The goal is to provide flexibility in the accomplishment of the mission by providing support for preliminary investigation of various alternative life sciences research and technology efforts which may result in formal research proposals ultimately becoming part of an approved RTOP. The director of life sciences, ARC, will review the proposed efforts and select the tasks which will become part of this RTOP Those tasks which show potential for further research pursuit will subsequently be submitted for future review and approval in the appropriate problem oriented RTOPs

Data Analysis

W83-70458

385-36-01

Marshall Space Flight Center, Huntsville, Ala SPACE PLASMA DATA ANALYSIS Charles R Chappell 205-453-3036 (188-36-55)

The objective is an adequate understanding of the dynamics of low energy plasma in the Earth's magnetosphere. This will be accomplished by (1) analysis of the light ion mass spectrometer data from the SCATHA satellite, (2) laboratory simulation of plasma flow around different objects, (3) modeling of thermal plasma procedures, (4) analysis of data and development of models relating to the effects of spacecraft plasma sheaths upon low energy charged particle data, and (5) development of multispacecraft merged data sets and advanced display techniques

W83-70459

385-38-01

Marshall Space Flight Center, Huntsville, Ala DATA ANALYSIS

E Hildner 205-453-0123

The objective is to understand coronal mass ejections, both in solar corona and in interplanetary space. The SMM Coronagraph/ Polarimeter data, correlative data, and numerical modeling are used The SMM and correlative data for individual mass ejection events are used to understand thoroughly the events creation and evolution and their relationship to other forms of solar activity. A list of coronal transients' occurrence and properties was prepared to facilitate comparisons between and among transient events. The behavior of idealized transients near the Sun was calculated through numerical modeling, and the coronal mass ejections in interplanetary space were examined both observationally (if data exist) and by numerical modeling

W83-70460

385-38-01

Goddard Space Flight Center, Greenbelt, Md SOLAR PHYSICS DATA ANALYSIS AND OPERATIONS Stuart D Jordan 301-344-6184

The objectives are to (1) process, analyze and interpret solar data from flight projects and to continue this work after the initial funding from project offices has been terminated (2) to publish in the scientific

literature detailed studies of phenomena gathered over protracted periods of time which reveal long term features and correlation effects not evident during the prime data analysis, (3) to engage in multidisciplinary studies comparing experimental data from other satellites and/or ground based laboratories in order to investigate in fine detail, fine structure, long term and secular efforts and (4) to provide additional reduced, analyzed data for archive in the National Space Science Data Center During the prime analysis period many theoretical ideas about the observed phenomena are developed and correlations of the data with other ground based or satellite data are suggested. In addition, to study a given phenomena over an adequate range of the important indepedent variables such as solar region, wavelength, solar cycle, etc., it is necessary to process large quantities of data covering extended periods of time Thus, additional data will be processed and analyzed, multiexperiment studies will be made and various proposed models or theories will be critically tested by use of these data Ground based spectroheliograph measurements will be correlated with satellite observations

W83-70461 385-38-01

Jet Propulsion Laboratory, Pasadena, Calif SOLAR AND HELIOSPHERIC PHYSICS DATA ANALYSES M Neugebauer 213-354-2005

Plasma and magnetic field data from ISEE 3 are used to study tangential discontinuities (TD's) in the solar wind. The TD's are selected for study because they do not propagate through the wind and thus retain some information about conditions at the solar source Emphasis is given to (1) understanding the frequency of occurrence and the nature of TD's from different sources of the solar wind (2) examining TD's which mark changes of solar wind composition in an attempt to understand the origin of helium abundance variations, and (3) using plasma variations across large, isolated TD's to estimate effective transport coefficients Magnetohydrodynamic (MHD) discontinuities are identified during routine processing of the ISEE-3 magnetometer data (E J Smith, Principal Investigator) Additional MHD discontinuities with smaller magnetic signatures can be found by visual inspection of plots of high time resolution plasma data processed at Los Alamos National Laboratory by the principal investigator for the solar wind experiment (S J Bame) In this work, high time resolution magnetic field data are used to perform a minimum variance analysis to determine the principal axes of the discontinuity. Field and plasma data are then combined to determine whether or not a discontinuity is tangential. Statistical analyses will be performed on the resulting set of TD's to search for and understand systematic associations with solar wind streams of different origins Multivariable correlation analyses will be performed for the subset of TD's which exhibit changes of helium abundance, and time profiles before and after suitable TD's will be examined in detail to model the rates at which different diffusion processes tend to destroy the discontinuities

W83-70462 385-41-01

Jet Propulsion Laboratory, Pasadena, Calif
APPLICATION OF DIGITAL IMAGE PROCESSING TECHNIQUES
TO ASTRONOMICAL IMAGERY
Jean J Lorre 213-354-2995

The objective of this task is to provide digital image processing support to astronomers who do not have such a capability and/or who are interested in finding out how image processing can help them in their analyses. The intent is to investigate and demonstrate how digital image processing techniques can be utilized in the analysis and display of information from astronomical imagery, to acquaint more members of the astronomical community with the basis for assessing the processing support requirements for Space Telescope imagery. It is proposed that the approach which has been successfully utilized for the past four years to accomplish this objective be continued. This approach consists of providing a base of funding from which small amounts of money are allocated to specific tasks. This is implemented as follows as ideas are conceived, or requests for support are received, they are formulated in terms of a specific task statement and cost. Permission to perform each task is then requested from the technical monitor. The effort proposed herein provides support for six specific requests for IPL collaboration which have been received during the past year

W83-70463 Goddard Space Flight Center, Greenbelt, Md DATA ANALYSIS ASTRONOMY J M Mead 301-344-8543 (188-41-51, 188-41-55)

The objectives are to develop tools and techniques which will facilitate and improve the reduction, analysis and understanding of astronomical data primarily through the application of computers for managing large blocks of bibliographical and observational information, including digitized images and spectra, obtained at all wavelengths for

stars, galaxies and other extended objects, and to produce a series of monographs on the subject, Nonthermal Phenomena in Stellar Atmospheres This will be accomplished by the (1) expansion of the current machine-readable data base by searching the journal literature, particlularly in the IR and UV, to obtain more complete data and bibliographical coverage combining catalogs of variable stars, cool stars and extended objects, observing with IUE to contribute to our knowledge of astrophysical plasmas A computerized astronomical data retrieval system, with associated software, to produce data searches, digital plots, and bibliographical information for specified catalog ID numbers, positions and other parameters at all wavelengths is proposed. Also, operation of an interactive astronomical data analysis facility, which is designed and operated to provide astronomers with the display, enhancement and analysis tools that they need to interpret their digitized images and spectra, and preparation of a series of astrophysics research volumes by laying out the best space data and discussing critically the current theories for interpreting these data are planned

W83-70464 385-46-01

Goddard Space Flight Center, Greenbelt, Md
HIGH ENERGY ASTROPHYSICS DATA ANALYSIS
F B McDonald 301-344-8801

The objectives are (1) to process, analyze and interpret galactic, interplanetary, Jovian and solar cosmic ray data from space flight experiments after the immediate funding project offices have ceased and for detailed studies of these phenomena involving multisatellite data sets (2) to engage in multidisciplinary studies comparing experiment data from other satellites, deep space missions and manned missions such as Skylab, as well as using ground-based observations to study in detail a wide range of high energy astrophysics phenomena. (3) to publish these results in the scientific literature and (4) to make the data available to the National Space Science Data Center

Astrophysics Institutional Support

W83-70465 405-02-02

Goddard Inst for Space Studies, New York
RESEARCH IN ASTROPHYSICS AT THE GODDARD INSTITUTE
FOR SPACE STUDIES AND COLUMBIA UNIVERSITY
Patrick Thaddeus 212-678-5621
(506-54-56)

This RTOP supports all GISS research in observational and laboratory astrophysics and theoretical quantum chemistry, and nearly all research and development in far IR detector development Objectives are (1) to discover new interstellar molecules, (2) to observe known molecules such as CO to study star formation and galactic structure, (3) to analyze COS-B gamma ray and forthcoming IRAS IR observations of molecular clouds, in comparison with CO GISS molecular cloud surveys, (4) to develop new coherent detectors and receivers for the far IR, (5) to undertake far IR spectroscopy in the laboratory to support GISS satrophysical research, (6) to conduct theoretical investigations of molecular collisions and molecular structure to support NASA programs

Technical Consultation and Support Studies

W83-70466 643-10-01
Lewis Research Center, Cleveland, Ohio
TECHNICAL CONSULTATION SERVICES

E F Miller 216-433-4000

385-41-01

The objectives are to (1) provide technical consultation services support in the area of space services with particular emphasis on preparing for international meetings relating to the fixed-satellite service (FSS). the broadcast-satellite service (BSS), and the mobile-satellite service (MSS), (2) provide the technical basis and regulatory support needed to obtain sufficient orbit/spectrum to meet current and projected requirements of NASA and the United States, and (3) perform studies, develop analytical methods for planning, conduct evaluations, identify technology status and needs, perform critical technology developments, perform measurements (where necessary) to determine sharing criteria. and evaluate alternatives that result in efficient and cost-effective use of the geostationary orbit/ spectrum resource. Specifically, these activities will support domestic and international preparations for the 1983 RARC (Regional Administrative Radio Conference) on broadcasting satellites at 12 GHz, support domestic and international preparations for the 1985/1987 Space Services WARC with emphasis on the FSS and the and support domestic and international MSS planning in the 806-890 MHz band. The described activities will be conducted within

the framework and schedules of the applicable CCIR Study Groups, the special preparatory committees established in the U.S., and the national and international meetings called to support preparations for the conferences. Efforts planned are a combination of in-house and contract activities

W83-70467

643-10-01

Jet Propulsion Laboratory, Pasadena, Calif SPECTRUM AND ORBIT UTILIZATION STUDIES Y H Park 213-354-3909

(643-10-02, 643-10-03)

The objective of this RTOP is to ensure the growth of space applications by providing the technical basis and regulatory framework needed to obtain sufficient spectrum/orbit to meet current and projected requirements. The results of this work will be used by NASA to help determine its frequency and orbit requirements and to ensure compatibility between NASA flight programs and other space and terrestrial services The results will also be used by NASA and other government agencies for the purpose of supporting CCIR and World and Regional Administrative Radio Conferences, in making decisions on frequency/ orbit utilization and assignments, ground-station and satellite approvals, and in providing for the growth of existing and new satellite services. The specific objective for FY-83 is to support NASA Headquarters with the analysis of orbit/spectrum issues to develop the domestic and international regulatroy framework for the MSAT-X program and the communications satellite services. The approaches are to participate in studies on planning frequency allocation and regulatory framework for the Mobile Satellite Experiment (MSAT-X) program and studies for NASA, CCIR, and Administrative Radio Conferences The studies for the MSAT-X program includes RFI Analysis, Transborder Frequency Sharing, Feeder Link Frequency Assessment, and MSAT-X Regulatory Support The economic/ institutional study on the future mobile satellite will be continued. Studies on the fixed, mobile and broadcasting satellite service will be maintained

W83-70468

643-10-02

Lewis Research Center, Cleveland, Ohio **NEW APPLICATION STUDIES** J R Ramler 216-433-4000

(643-10-01, 643-10-03)

The objectives of this RTOP are to (1) identify and define applications for communication satellites, (2) define preliminary concepts, configurations, requirements, and costs of alternative operational systems for new applications, (3) identify the technologies required to enable the implementation of advanced operational communication satellites. and (4) formulate preliminary plans for developing the required technologies The approach is to formulate and carry out in-house and contracted studies to meet the objectives. These studies will be of a scoping nature and will address the technical, economic and institutional/ regulatory feasibility of operational systems

W83-70469

643-10-02

Jet Propulsion Laboratory, Pasadena, Calif

COMMUNICATIONS SATELLITE NEW APPLICATION NOTIFICA-TION STUDIES

F Naderi 213-354-6288

(643-10-01, 643-10-03, 506-61-45)

The general technical objectives of this RTOP include aid in providing for the growth of existing satellite services and new communications satellite applications, and ensuring compatibility of NASA's communications flight programs with other space and terrestrial services. This aid is particularly related to NTIA's charter to facilitate the transfer of space technology for public service applications. Government procedures require all agencies to submit proposed new space systems concepts to IRAC and OMB for review four to six years prior to their planned date of initial operation. This is to ensure spectrum availability for telecommunications systems prior to commitment of public funds. In order to fulfill this requirement, this RTOP will include studies of systems concepts with potential applications within the NASA Communications Program These studies will include conceptual designs, user functional requirements, technical requirements, system descriptions, frequency and bandwidth requirements, cost effectiveness, system tradeoffs, and sharing studies required to demonstrate compatibility with existing or planned services In FY-83 this RTOP will concentrate entirely on system studies associated with the planned US/Canada MSAT Project. The system studies to be performed generally fall into two categories the NASA Mobile Satellite Experiment (MSAT-X) definition, and Canadian MSAT/Phase B participation The studies under the first category deal primarily with those areas of particular interest to the U.S. which have no direct relationship to the spacecraft the studies under the second category include those which jointly affect the experiment definitions of both countries and those which affect the spacecraft design

W83-70470

643-10-03

Jet Propulsion Laboratory, Pasadena, Calif. PROPAGATION STUDIES AND MEASUREMENTS E K Smith 213-354-8040

(643-10-01, 643-10-02)

Radiowave propagation constraints in the earth space environment must be understood and accounted for in the design and specification of space communications systems. The Propagation Studies and Measurements program provides the focal point for national activities which support NASA's applications programs, development of prediction models, frequency allocation recomendations, orbit and spectrum use decisions, system specification and performance criteria related to space communications. The objectives of the NASA Propagation Studies and Measurements Program are to provide an understanding and analysis of the basic propagation mechanisms which hinder reliable earth space communications, and to develop predictive models for the quantitative evaluation of propagation effects in the bands allocated for space applications. The objectives of the program are accomplished under three major task activities (1) propagation measurements and experiments, (2) propagation effects modeling and prediction and (3) propagation assessment and evaluation studies. The first area is structured to provide the data base, from satellite based experiments (e.g., ATS, CTS, COMSTAR and SIRIO) and ground based techniques, for the development and validation of prediction models and system performance The second area supports the development of rain attenuation, depolarization, site diversity, etc., models used for system design applications The third area involves NASA participation in the CCIR (International Radio Consultative Committee), including WARC (World Administrative Radio Conference) preparatory studies and document preparation The publication and updating of the NASA Propagation Effects Handbook for Satellite Systems Design for frequencies below 10 GHz is a major element of this area (companion to NASA Reference Publication 1082, December 1981)

Experiment Coordination and Operations Support

W83-70471

646-41-01

Lewis Research Center, Cleveland, Ohio EXPERIMENT COORDINATION AND MISSION SUPPORT J R Ramler 216-433-4000

The objective of this effort is to provide continuity of service and orderly transition of user community operations on NASA experimental satellites to commercial satellite systems. The approach is to contract with the Public Service Satellite Consortium to assist and coordinate public sector user activities in satellite communications, and to continue development of in-house telecommunications capabilities and facilities to support applications experiments coordination and new satellite communication missions

W83-70472

646-41-02

Ames Research Center, Moffett Field, Calif APPLICATIONS EXPERIMENTS PROGRAM SUPPORT B P Gibbs 415-965-5001

(643-10-01, 643-10-02, 643-10-03)

The objectives of this RTOP are to (1) coordinate with other Federal agencies and public sector organizations in the development of experimental satellite communications activities for emergency/disaster communication and public service applications, (2) assist users in the transition from the NASA experimental satellite to commercial satellites where continuity of service can be assured, (3) demonstrate Application Technology Satellite (ATS) technology and its applications for other governmental agencies and the public service sector and (4) develop new techniques and applicable hardware for use with ATS. To meet these objectives in the development and transfer of satellite communication technologies, the approach will be to conduct satellite demonstrations and experiments using the ATS satellite and engage in direct interaction with potential and ongoing users of the spacecraft. This interaction will identify users' needs requiring the development of new technologies

Advanced Communications Research

W83-70473

650-60-00

Jet Propulsion Laboratory, Pasadena, Calif MOBILE SATELLITE EXPERIMENT Y H Park 213-354-3909 (643-10-01, 643-10-02, 643-10-03)

The overall objective of this RTOP is to develop cost and performance effective technology for the mobile equipment and the base station for first generation mobile communications satellites and the NASA mobile satellite experiment (MSAT-X) program. The specific objectives in FY-83 and FY-84 are to develop working breadboards of the mobile equipment with various advanced system design requirements, to develop breadboard base stations including network control systems, and to establish the system design specification for the engineering model of the mobile equipment and the base station to be implemented for the MSAT-X The approach is to perform technology assessment and develop necessary technology under three broad tasks transceiver development, mobile antenna development, and base station development. The transceiver development task includes subtasks such as (1) modem development and simulation, (2) coding and compression, (3) control unit, and (4) integrated transceiver breadboard. Three breadboards of transceivers will be developed one for the baseline narrowband FM modulation and two for the advanced analog and digital modulation schemes. The mobile antenna development task includes development, analyses and evaluation of a high gain electronically tracking antenna and low or medium gain nontracking antennas for the MSAT-X and future mobile satellites. The base station development task includes the preliminary system design, assessment of existing hardware, development of breadboards, and prototype design specifications

W83-70474

650-60-20

Lewis Research Center, Cleveland, Ohio SPACE COMMUNICATIONS SYSTEMS ANTENNA TECHNOLOGY J W Bagwell 216-433-6196 (650-60-21, 650-60-22, 650-60-23)

The objectives of this research are to conduct SR and T development on multibeam antenna system for advanced geostationary communication satellites and supporting Earth terminals Efforts will be directed at applications of such antennas for multiple spot beams and scanning beams. Current efforts under this RTOP will (1) develop proof-of-concept hardware of flight systems directed at the experimental verification of multibeam technology in 1988, and (2) develop and evaluate designs for advanced communications equipment for multiple channel Earth stations Dual technology contracts are being pursued during the FY-80/83 time frame to accomplish the near term flight objective A single technology contract is being pursued during the FY-82/83 time frame to accomplish the Earth station near term objective

W83-70475

650-60-21

Lewis Research Center, Cleveland, Ohio SATELLITE SWITCHING AND PROCESSING SYSTEMS J W Bagwell 216-433-6196

(650-60-20, 650-60-22, 650-60-23, 650-60-26)

The aims of this RTOP are to develop the switching technology for the routing of signals (message traffic) aboard multibeam, multichannel communications satellites, and to develop spectrally efficient, high data rate digital modulation technology Currently work is proceeding under this RTOP via contract for the design and development of a baseband processing (i.e. digital routing) proof-of-concept system for communications satellite applications, included in which is the development of the enabling LSI technology for system implementation

W83-70476

650-60-22

Lewis Research Center, Cleveland, Ohio RF COMPONENTS FOR SATELLITE COMMUNICATIONS SYS-TEMS

J W Bagwell 216-433-6196 (650-60-23, 506-54-04)

The task of this research is to perform supporting research and technology development in the area of space related RF components including power amplifers (tube and solid state), low noise receivers, and other components. Initial efforts center on those components identified as needed in the 30/20 GHz band for advanced communications technology satellites (ACTS) systems studies. Studies will also determine the ranges of applicability of various component design configurations as functions of performance requirements and physical characteristics, e g volume, weight, power By means of principally a contractual program, the research will develop analysis and synthesis techniques for the above space program components, apply the developed techniques to determine the basic characteristics of components meeting specified requirements, fabricate experimental components, and test and evaluate fabricated components

W83-70477

650-60-23

Lewis Research Center, Cleveland, Ohio
COMMUNICATIONS LABORATORY FOR TRANSPONDER
DEVELOPMENT AND SATELLITE NETWORK EVALUATION

J W Bagwell 216-433-6196

(650-60-20, 650-60-21, 650-60-22)

The objective of this RTOP is to design and develop a laboratory test facility to be used to test communication system components and subsystems, and to provide laboratory simulations of satellite communications systems. The approach will be to design, develop, and test 30 GHz uplink, frequency translator and 20 GHz downlink systems. Continous bit stream rates of nominally 50 MBPS and 500 MBPS will be used to modulate the links End-to-end calculations will be made Software simulation results will be compared with the hardware simulation results Upon completion, network control methods will be added and bursty data transmissions will be tested and evaluated in both hardware and software Finally, the baseband processor and several simulated stations will be integrated. Software simulations and hardware tests will be correlated to produce a thorough understanding of the multiple facets

W83-70478

650-60-26

Lewis Research Center, Cleveland, Ohio

ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE (ACTS) SYSTEM STUDIES

W H Hawersaat 216-433-6685

(650-60-20, 650-60-21, 650-60-22, 650-60-23)

The objective is to define Advanced Communications Technology Satellite systems and services that emphasize the high risk technology required to ensure continued U.S. preeminence in satellite communications. The approach is to conduct in-house and contracted studies to assess market needs, determine system requirements, and define the satellite systems and services requiring future space-ground advanced communications technology. The output from these market operational, and experimental system requirement studies will be used to provide guidelines in the development of requirements for future space-ground advanced communications technology research and development. All preproject activities for the first flight experimentation, which focuses on the technology associated with high gain multibeam antenna systems which require flight experimentation as an essential part of their technology development process, are to be identified and carried out Additional efforts necessary to prepare for the first flight including experiment planning activities and in-depth analysis in areas where further definition will assist overall program and project planning, will also be conducted

Data Systems

W83-70479

656-13-40

Jet Propulsion Laboratory, Pasadena, Calif OCEANIC PILOT SYSTEM Klose 213-354-6957

The objectives of this activity are to develop, through user interaction, an in-depth understanding of the user requirements for archiving, processing, display, and distribution of remotely sensed and conventional oceanic data sets, evaluate, design, and implement the appropriate computer technologies, standards, and applicable products for an oceanic information pilot system and provide a dedicated computer system on which to develop and demonstrate new capabilities which support the information processing needs of NASA's oceanic research community These objectives will be pursued through the design, development, and operation of an Oceanic Pilot information System (OPS) This system, implemented on a dedicated VAX computer system provides researchers in the oceanographic community with interactive access to selected satellite and conventional data sets. It will be developed in multiple steps. The principal reason for a multistep implementation is to make maximum use of feedback from the science community. The user group participating in this project will have an integral role in the system development and evaluation. The initial uses are being drawn primarily from several institutions having a particular interest in satellite oceanography Scripps Institution of Oceanography (SIO), Woods Hole Oceanographic Institution, (WHOI) Massachusetts Institute of Technology (MIT), Florida State University (FSU), Oregon State University (OSU), Naval Post Graduate School (NPS), and JPL

W83-70480

656-26-02

Goddard Space Flight Center, Greenbelt, Md ATMOSPHERES AND CLIMATE DATA MANAGEMENT Paul H Smith 301-344-5876 (656-13-30, 656-30-30, 656-44-10)

A pilot climate data base management system (PCDBMS) demonstration system was implemented in FY-82. During FY-83, the objectives of the PCDBMS are to provide data management support to climate researchers, expand the central directory and catalog of OSSA data sets, support atmospheric and meteorological researchers through the data catalog and inventory data bases, evaluate the demonstration system, and develop requirements for a pilot operational system. The evaluation and requirements development will be done with the assistance of a scientific advisory group, and will include investigating the use of PCDBMS facility and techniques to provide management of data sets residing on the Goddard applications computing facility. The development of the demonstration system will continue in order to support a growing number of users. The continuing development will include adding new data sets as well as providing new capabilities to the users of the system In order to achieve the above objectives, the PCDBMS will continue to operate and maintain its computer facility, and provide support for data operations and software maintenance

W83-70481 656-30-01

Goddard Space Flight Center, Greenbelt, Md INFORMATION SCIENCES RESEARCH AND DEVELOPMENT John C Lyon 301-344-8744

Numerous unsolved problems exist and continue to be discovered in the organization and development of data systems and software for preparation and analysis of data derived from space platforms. Such problems are accentuated when these data must be integrated with source information from other measurement and records systems. The proposal herein constitutes an integrated and focused approach to the solution of a number of such diverse, but related problems, representing generally recognized critical elements of various applications disciplines support requirements either not or only partially satisfied by existing data systems. The problems have been selected under considerations of practicality of solution breadth of potential application, and general significance. Topical areas under the initial year of this study program include ten elements in (1) data compression, (2) application of advanced high speed processing technology (3) reduction of labor intensity in analysis systems, (4) improved treatment of and preparation of integrated source data sets, and (5) advanced machine based data handling and information extraction procedures. Substantial interplay exists between many of these elements, and practical demonstration of results is proposed to be conducted within existing facilities at the Goddard Space Flight Center via software developed under this proposal. Subsequent activities are to be defined as likely extensions of promising results of FY-83 studies, as well as additional problems in system organization and development suggested by perceived need

W83-70482
Jet Propulsion Laboratory, Pasadena, Calif

DIGITAL IMAGE RECOVERY AND DATA MANAGEMENT Michael D Martin 213-354-6065 (656-80-01, 656-13-40)

The primary objective of this effort is to convert the existing set of planetary image data on digital magnetic tape into a data base of well documented and commonly formatted image data sets accessible to users via modern data base management and data communications techniques. In addition the effort will identify image data files which have been lost or degraded and allow them to be regenerated before backup data sources (master data records) are also lost or recycled Execution of this effort will allow a minimum of 24,000 magnetic tapes to be released from Federal storage areas. The host computer system and data base management system (DBMS) will be selected based on computer availability, cost and compatibility with related projects at JPL (ocean pilot, planetary data systems, multimission image processing laboratory, etc.) A common data format for output image files will be designed and reviewed by potential users including the regional planetary image facilities planetary science users, as well as JPL and NASA's end-to-end data system engineers. After the selection of the host computer and the DBMS, existing catalog data bases will be loaded into the new DBMS and the production of software to convert existing image data sets to a common output format will begin. These programs will interact with the DBMS to extract information necessary for output image labels and to update the data base with processing summary information, location and identification of output image files and engineering parameters extracted from the input data sets. Image data set processing will be prioritized by frequency of utilization by the science community and to provide immediate support to research programs in progress

W83-70483 656-42-01

Marshall Space Flight Center, Huntsville Ala MASS STORAGE NETWORK R&D James L Green 205-453-0028 (385-36-01)

The objective of this research is to support NASA scientific researchers in their satellite and ground based instrument data analysis efforts by developing and demonstrating improved computer-to-computer networking techniques for sharing data among distributed science data bases

W83-70484 656-44-03

Jet Propulsion Laboratory, Pasadena, Calif
SAR DATA SYSTEM RESEARCH AND DEVELOPMENT

Chialin Wu 213-354-2061 (506-61-35)

The overall objective of this RTOP is to develop, evaluate and demonstrate data processing techniques and end-to-end data system concepts to facilitate and automate transmission, processing, analysis, and archiving of data gathered by future NASA Shuttleborne and airborne radar sensors. The activity is particularly focused on the data handling system for the SIR-B mission, which is the first of a series of synthetic aperture radar (SAR) Shuttle flights to acquire data in digital format. A three year plan is proposed here. The major thrust of this work is to develop a more flexible SAR data processing system using state-of-theart programmable array processors which will be able to handle both the SAR correlation and the more general purpose post correlation processing functions. A goal is to upgrade the existing interim digital processor (IDP) and demonstrate at least four times increased throughput. which corresponds to 30 minutes per SEASAT SAR frame. The benefit is two fold (1) the improved system would provide increased quantity and quality of science data products for SIR-B without increased costs, and (2) the development provides a system technology applicable to future SAMEX data handling needs as well as a number of other NASA remote sensing data processing tasks. The plan also addresses SAR data system concepts such as multimission (SIR-B and beyond) data system standards, large volume, high speed data storage devices, and schemes for improving SAR image quality. The RTOP includes a plan to upgrade the IDP for SAR correlation and image processing needs in mid 1980's, and a continuing development for the multimission end-to-end data system. The RTOP has its short term objectives focused on benefits to the SIR-B project. Technology advancement made by this task would, provide long term benefit for all future OSSA sponsored SAR missions including SAMEX, Venus Mapper, etc.

W83-70485 656-44-06
National Space Technology Labs , Bay Saint Louis, Miss

ADVANCED TECHNOLOGY GLOBAL RESOURCES NETWORK
Sidney L Whitley 601-688-3586

The objective of this effort is to define and implement a global resource information system consisting of an interactive computer network, selected resource related data bases, smart terminal processing systems, software processing and analysis tools, and utilization procedures for use by the global scientific and management community to monitor and/or help solve such problems and areas of concern as the ozone layer, the carbon dioxide problem and to assist in the exploration of energy sources. During the first year, a study will be conducted which results in a system design and a preliminary program plan After program plan approval, a prototype system will be implemented and tested in phases within the NASA/University environment, and ultimately in the international community. Foreign country participants will be required to share in the implementation costs for the system Extensive coordiunation will be required between NASA, University, Department of State, and when apropriate, selected foreign participants.

W83-70486 656-44-10

Goddard Space Flight Center, Greenbelt, Md
TRANSPORTABLE APPLICATIONS EXECUTIVE (TAE)
D Helfer 301-344-9425

(656-11-04, 656-30-30 656-26-02)

The objectives of this RTOP are to continue development of a software executive under which new interactive applications data systems may be implemented in an efficient and cost effective manner, and which features (1) the ability to transport multi-source and multi-discipline data and applications software between systems, (2) distributed remote processing within a network of computers, and (3) device-independent imaging and graphics services. Under this RTOP, the concepts and software necessary to support a transportable interactive analysis base and techniques for distributed processing with integral catalog management, executive control, communications, and image and graphics processing will be developed, evaluated and demonstrated. This RTOP supports the following major programs the severe storms research program, the VAS demonstration project, the LANDSAT-D assessment

system, the networking RTOP, and the atmospheres and climate data management RTOP, and it is expected, the upper atmospheric research satellite. The transportable applications executive (TAE) Version 1 will be designed, implemented and distributed to selected sites for field test and evaluation. Requirements and design of the TAE remote capability will be completed. Applications software will be converted to run under TAE. A basic portable imaging and graphics capability will be built and demonstrated. A user resource and support office will be supported.

W83-70487 656-50-01

Goddard Space Flight Center, Greenbelt, Md IMPROVED ON-LINE AVAILABILITY OF DATA
Joseph H Bredekamp 301-344-8541

The aims are to significantly increase the volume of on-line storage available for interactive scientific data analysis, provide large-volume central data facility for shared use among both central and distributed computers, and facilitate multi-mission correlative studies. The approach will be to acquire and integrate a mass storage device in the Science and Applications Computing Center (SACC). This first stage demonstration activity will increase the current on-line storage volume by a factor of 40. Other advancing storage technologies will be investigated. General user availability will be expanded through the sciences directorate local area network (RTOP 656-85-01). Availability will be extended to both on-site Goddard and off-site scientists.

W83-70488 656-60-10

Goddard Space Flight Center, Greenbelt, Md

ADVANCED TECHNOLOGY IMAGE DIGITIZATION

D A Klinglesmith 301-344-6541

This RTOP is concerned with the development of a high speed digital microdensitometer for use with astronomical imagery. The major need for the new microdensitometer results from the increased requirements in photometric precision and overall system throughout The standard astronomical microdensitometer currently in use around the world is capable of digitization at a rate of a few thousand samples per second at low density and only a few hundred samples per second at high densities (above 3 OD). The current photometric precision is in the range of 001D Our approach will be twofold First, an effort will be directed at extending the currently accepted machine to its limits This will be done by replacing existing electronics with modern moduals and thereby gain at least a factor of 5 to 10 in speed without any significant decrease in photometric response. Second, an effort will be directed at determining the specifications for the next generation high speed astronomical densitometry. This will be done by defining the astronomical requirements in terms of image material, photometric precision, system throughput, digital data storage and long term stability

W83-70489 656-80-01

Jet Propulsion Laboratory, Pasadena, Calif PLANETARY DATA NETWORK PROJECT

A L Lane 213-354-7362 (656-31-02 656-13-40)

The objective is to develop a coordinated data management approach for NASA's planetary data sets, and implement a limited number of data processing capabilities at selected institutions to demonstrate and evaluate new data access and processing techniques. The planetary data network represents a 5-year computer technology project aimed at improving user access to planetary data from the Voyager, Viking, Pioneer and Mariner missions. New computer based capabilities will be implemented at several institutions where there are cognizant planetary scientists working with the data, and at which institutional support is present to sustain the research activity. In the planned approach, selected planetary data will be distributed among the participating institutions and will include both image and non-image data types, assembled in compatible digital format, with attribute information available through online catalogs. Various computer technologies will be considered, including electronic browsing, graphics, networking, and mass storage on both video disks and digital optical disks. The scientists participating in the planetary data network will be responsible for the project design and implementation to insure direct user involvement throughout all phases of project evolution and evaluation. A science steering group will be formed to represent the broader science community and to provide feedback on specific approaches planned or executed. The capabilities developed will be available to new users as part of NASA's ongoing planetary research program, and will form the baseline system for the storage, achiving and distribution of new planetary data (e.g., Voyager/Uranus, Galileo, and future mission)

N83-70490 656-85-01

Goddard Space Flight Center, Greenbelt, Md
SCIENCES DIRECTORATE LOCAL AREA COMPUTER NETWORK
William H Mish 301-344-5444

The aim is to permit flexible, and easily distributed computing by tying together computing facilities and peripherals both internal and external to GSFC and specifically to implement a local network of sciences directorate computers using a robust architecture that will permit easy future expansion. The initial network to consist of the IBM 3081, VAX 11/780, and a PDP 11/44. The approach will be to (1) compare existing MITRE SNAP network study with the results of an active sciences directorate study to evaluate other alternative architectures. (2) implement a pilot local area network of the IBM 3081 (Code 603). VAX 11/780 (Code 690) and PDP 11/44 (Code 680) using this architecture. (3) expand this pilot network to include PDP 11/70 (Code 660), NSSDC (Code 601), and additional GSFC computers, and (4) additionally expand the network to include a gateway to remove networks, e.g., ARPANET, and computers external to GSFC.

W83-70491 656-90-01

Goddard Space Flight Center, Greenbelt, Md

GENERAL GROUND SUPPORT EQUIPMENT (GSE) SOFTWARE TECHNOLOGY EXTENSION

Gerald Muckel 301-344-5778

During the past several years, a general purpose software system has been developed to support the integration, testing, and operation of flight scientific instruments. The purpose of this RTOP is to further develop this system and to adapt it to recently developed hardware in order to support future NASA missions. Specific objectives are to (1) enhance the existing ground support equipment (GSE) software to include graphics support, (2) reduce the amount of computer specific (i.e. assembly language) software by reorganization of the software and the internal data structures, and (3) increase the effective telemetry data rate handling capability needed to support the processing of large quantities of data in real time. The feasibility of including interactive graphics software and hardware in the GSE will be investigated. Assuming it is feasible, the procurement for a prototype graphics device will be carried out and implementation of general purpose software to support this activity will be done. Reorganization of the data structures used by GSE software will be carried out. This will consist of implementing a disk-based data structure in place of the memory resident data structure now in use

Weather and Climate Data Analysis

W83-70492

672-20-09

Jet Propulsion Laboratory, Pasadena, Calif

CLOUD PROPERTIES FROM SATELLITE RADIANCES

J P Schieldge 213-354-2046

Algorithms and techniques will be developed to obtain cloud properites from multispectral satellite data sets. The main data sets will consist of advanced very high resolution radiometer (AVHRR) radiance measurements from TIROS-N and NOAA-6 satellite flights. The data will be analyzed using statistical, pattern recognition, and analytical methods. These methods will be compared with one another to assess their respective advantages and disadvantages. This research will support the NASA Climate Research Program's efforts in developing a global cloud climatology.

W83-70493 672-30-00

Goddard Space Flight Center, Greenbelt, Md

GLOBAL CLIMATE MODEL DEVELOPMENT AND APPLICATIONS
James Hansen 212-678-5619

The objective is to develop and apply climate models to support NASA's role in the National Climate Program, particularly by helping to define observing systems requirements for monitoring analysis and prediction of long-term climate Appropriate climate modeling capability will be developed to conduct numerical experiments including climate process diagnostic studies, with current focus on the role of clouds and solar irradiance variations in the global climate system as well as measurement parameter sensitivity studies and observing system simulation studies

W83-70494 672-40-00

Goddard Space Flight Center, Greenbelt, Md

CLIMATE OBSERVATIONS

Otto W Thiele 301-344-9006

The objectives of this RTOP are to (1) study ways of using available satellite data to measure or infer climate parameters (e.g., ocean/air heat flux, sea surface temperature soil moisture, etc.). (2) evaluate spaceborne techniques for precipitation measurements, (3) participate in preliminary feasibility studies of potential climate space missions with emphasis on the space platform/space station approach, and (4) determine changes in solar size and relate to changes in solar

luminosity which in turn relates to the total energy available to the earth/atmosphere system Transfer functions will be developed to extract climate parameters from visible and infrared sensors on both low and geosynchronous earth orbiting satellites with emphasis on ocean/ atmosphere boundary conditions for extending heat flux estimates from coastal regions to the open oceans. Instrumentation and sampling options will be investigated for important climate parameters such as global precipitation, surface wind fields, improved sea surface temperature etc, as an integral part of a global environmental and ecology mission adaptable to the space platform/station concept. Solar eclipse data will be analyzed and the relationship between radius and luminosity changes will be modelled. The solar diameter will be measured directly and model changes will be made in size, shape, and surface temperature to changes in total solar flux

W83-70495

672-40-08

Jet Propulsion Laboratory, Pasadena, Calif **SOLAR IRRADIANCE ROCKET EXPERIMENT** C Willson 213-354-3529

The objectives of the FY-83 solar irradiance rocket program are (1) to provide an inflight reference point for evaluating the long term precision of the 1 AU total solar irradiance records of two satellite solar irradiance monitoring experiments - the Active Cavity Radiometer Irradiance Monitor (ACRIM) on the Solar Maximum Mission (SMM) and the Earth Radiation Budget/HF (ERB/HF) on NIMBUS 7, (2) to advance the state-of-the-art in defining the absolute radiation scale at the total solar irradiance level and (3) to relate these state-of-the-art measurements to user instrumentation. Two rocket flights will be conducted in FY-83 using the ACR/ERB/PMO payload developed during FY-82 The first will occur as early in FY-83 as possible to provide a near term reference with the SMM/ACRIM and NIMBUS-7/ERB The last will coincide with the flight of the Spacelab 1 mission for the purpose of transferring the rocket measurement record to the Spacelab ACR and CROM solar irradiance instrumentation at the precision level The ACR and ERB rocket experiments are representative of the SMM/ACRIM and ERB/HF technology and were compared with those experiments. The Swiss PMO experiment, provided at no cost, provides an independent measurement capability to aid in evaluating the rocket results Preflight intercomparisons will be conducted between rocket and reference sensors both in air and vacuum at the Solar Testing Facility of JPL's Table Mountain Observatory

W83-70496

672-50-00

Goddard Space Flight Center, Greenbelt, Md CLIMATE PROGRAM SUPPORT

Otto W Thiele 301-344-9006

The objective is to (1) provide program support to NASA Headquarters and Goddard for a broad based NASA climate program which in turn involves a substantial contribution to the National Climate Program, and (2) provide resources for the Climate Program's share of HSVP computing support Recommendations for climate program initiatives are developed in connection with NASA, GSFC climate research. Planning support for a global satellite climate data base development is provided. especially a global cloud climatology under the international satellite cloud climatology project. Representation to the Climate Information Subgroup of the National Climate Policy Board is provided Planning strategies for physical processes studies are developed with particular emphasis on cloud and earth/atmosphere radiation processes, and support for annual national climate reports to Congress, annual sciences reviews, etc are provided Ad hoc science working groups, advisory panels, etc are arranged for and both in and out of house climate program computing requirements are coordinated Resources provided will be appropriately shared for hardware acquisition, operations, and programming assistance

W83-70497

672-50-06

Jet Propulsion Laboratory, Pasadena, Calif CLIMATE RESEARCH PROGRAM SUPPORT

M T Chahine 213-354-2433

The objective is to provide the Climate Research Program, Environmental Observation Division, NASA Headquarters with program support during FY-83 JPL will provide the services of a member of its scientific staff as a detailee working under the direction of the Manager, Climate Research Program Support will also be supplied in the development and implementation of Climate Research Program plans for the use of remote sensing techniques to study atmospheric and ocean processes as-elements of climate research --

Stratospheric Monitoring Data Analysis

W83-70498

673-11-00

Goddard Space Flight Center, Greenbelt, Md DASIBI MEASUREMENT OF OZONE PROFILE AND COLUMN-CONTENT

J E Ainsworth 301-344-8256

The objective is to obtain accurate in-situ measurements of atmospheric ozone concentration, column content, and diurnal change in concentration in the region from 0 to 40 km altitude. The results will be used to provide verification of satellite measurements used for determining the long term change in the total global ozone, and to provide data necessary for the further refinement of ozone modeling Development and testing of the instruments and procedures necessary for obtaining highly accurate ozone measurements from balloons will be emphasized. The instruments comprise a UV photometer of primary standard quality for measuring ozone, along with instruments for accurate measurement of atmospheric and instrument pressures and temperatures Measurements, which are believed the most accurate ones of ozone concentrations presently available for the region from 0 to 40 km altitude, have an estimated maximum error of + or - 35% at the ozone maximum and + or - 8 5% at 40 km Column content error is + or - 4 5% Substantial additional reduction of errors is necessary in order to obtain present objectives. The goal is to reduce the estimated maximum error in the ozone concentration measurements to 2 2% at 25 km and 4% at 40 km by the end of FY-83. Column content error will be reduce to \pm or \pm 3%. Note that the above errors, the uncertainty of the ozone absorption coefficient at 253 65 nm contributes an error of + or - 15%

W83-70499

673-13-00

Goddard Space Flight Center, Greenbelt, Md INTERCOMPARISON OF DOBSON AND INTERFEROMETRIC **SPECTROMETER**

C L Parsons 301-928-5390

The standard instrument for ground-based measurements of total atmospheric ozone content is the Dobson spectrophotometer, a double prism spectrometer which uses slits to isolate eight pairs of lines of interest in the wavelength region between 3055 and 3398A. It is an antiquated design which uses hardware that is increasingly difficult to maintain, and it is a bulky system that lacks portability. Various filter and grating spectrophotometers are being tested by others as potential replacements for the Dobson. This project has as its goals the development of a Fourier transform spectrometer prototype system for the study of the advantages and disadvantages of this technique compared to the conventional dispersive spectra approach. A system of limited capability has been constructed. Hardware improvements are necessary to increase the system's spectral resolution, to add an absolute calibration capability. and to provide graphical data products. With these, the prototype Fourier transform spectrometer will be a valuable tool for studying the capabilities of the technique at wavelenghts into the near ultraviolet

W83-70500

673-14-00

Goddard Space Flight Center, Greenbelt, Md AIRCRAFT BORNE LIDAR FOR 03 AND OH MEASUREMENTS William S Heaps 301-344-5106

The objective is to complete and fly an aircraft borne LIDAR system for the measurement of trace constituents in the troposphere particularly O3 and OH Several engineering flights will be made on board the NASA Electra in an attempt to detect O3, OH and NO It is expected that an operational LIDAR for participation in multispecies field programs will be produced Additionally geophysical data is expected from the initial engineering flights

W83-70501

673-15-00

Goddard Space Flight Center, Greenbelt, Md **ABSOLUTE SOLAR FLUX AND VARIABILITY**

J E Mentall 301-344-8959

The objective is to measure the solar irradiance outside the Earth's atmosphere over the approximate wavelength range 120 to 400 nm. and to determine the variability of the Sun's UV flux over the period of a solar cycle Using sounding rockets, measurements are made of the solar irradiance over a complete solar cycle. Flights are made once or twice per year and satellite measurements are used to correct for the Sun's short term variability Since long term changes in the Sun's output may be on the order of 1% per year, a good deal of attention is paid to the precision of the calibration sources. The UV solar flux variability will be determined. Ground truth measurements for satellite instruments such as the SBUV instrument on Nimbus 7 and the solar flux experiment on SME will be made, and calibration techniques in the UV will be improved

W83-70502 673-18-00

Goddard Space Flight Center, Greenbelt, Md CORRELATIVE MEASUREMENT IMPROVEMENTS

C Holland 804-824-3411

The objective is to evaluate and improve correlative measurements made in support of satellite ozone sensors. These include (1) the optical rocket ozonesonde (ROCOZ), (2) the balloon-borne electrochemical ozonesonde (ECC) and (3) the meteorological rocket datasonde. Studies to automate the acquisition, processing, analysis and distribution of correlative measurement data will be initiated. Note the Dobson instrument is addressed in a separate RTOP (673-13-01-30). This effort is in conjunction with the ROCOZ transition plan (March 1982 - March 1983) and addresses tasks not covered there. It embraces consolidation, integration, testing, calibration and analysis of ROCOZ hardware and data under one roof at WFC Rational filter characterization methods and validation of same will be developed. Absolute payload calibration in conjunction with facilities at GSFC will be established An improved environmental test chamber for testing ECC's under realistic stratospheric conditions will be developed Error sources will be identified and the possibility of generating individual ECC calibration profiles will be investigated Sensor electrochemistry and possible cell modifications aimed at improving high altitude performance, and resolution and precision of high altitude ozone data by shifting to digital data transmission system will also be investigated. State-of-the-art techniques exist for modifying the existing U.S. rocketsonde instrument to provide direct pressure measurements and to reduce or eliminate the radiation error affecting the present bead thermistor

W83-70503 673-31-00

Goddard Space Flight Center, Greenbelt, Md

INVESTIGATION OF UPPER ATMOSPHERE DYNAMICS WITH NIMBUS-7 SATELLITE DATA Kaichi Maeda 301-344-5227

The objective is to analyze and interpret the ozone data with particular emphasis on the semiannual oscillations which might have a connection with well known geomagnetic variations. Using a new inversion algorithm (named the Direct Method), which was developed previously under this RTOP, the monthly zonal mean of ozone densities at several altitudes from 30 km up to 60 km in the geographic latitude bands from 80 deg N to 80 deg S will be produced Applying harmonic analysis to these results, the spatial structure of the semiannual oscillation of stratospheric and mesospheric ozone will be obtained. Similar variations can be found in the atmospheric temperature and pressure fields from the Nimbus SCR and PMR experiments. Separating the variation in the polar regions from the equatorial one, a possible mechanism for these oscillations and connection with geomagnetic activity will be considered Other objectives are to (1) determine the global structure of the semiannual oscillation in atmospheric ozone between 30 km and 60 km from the 1978 to 1981 Nimbus 7 SBUV data, (2) determine the phase variations of these oscillations with altitude from harmonic analysis of data, (3) provide theoretical interpretations of the results, including the cause of hemispheric differences and possible connections

W83-70504 673-41-00

with middle atmospheric dynamics and geomagnetic variations

Goddard Space Flight Center, Greenbelt, Md VARIABILITY AND TRENDS IN STRATOSPHERIC OZONE, THE MIDDLE ATMOSPHERE, AND UV SOLAR FLUX VARIATIONS Donald F Heath 301-344-6421

The objective is to (1) analyze and interpret atmospheric ozone, meteorological and UV solar flux data for the investigation and $\,$ determination of sources and mechanisms responsible for the natural variability of the middle atmosphere, and investigate secular changes in stratospheric ozone, determine trends and identify anthropogenic and solar related effects, and evaluate the effects and changes in ozone and UV solar flux on the structure and dynamics of the middle atmosphere Through the use of harmonic and trend analysis techniques, long and short term variations of ozone are investigated on a global scale for possible mechanisms which determine the spatial and temporal variability of ozone Variations in UV solar spectral irradiance are studied for information on mechanisms which can produce a variable ultraviolet solar flux input at the top of the atmosphere Existing models of the solar atmosphere are used to study possible solar processes. Observed variations in ozone, UV solar flux, atmospheric temperature, winds and structure are evaluated for consistency through existing multidimensional atmospheric models at GSFC

Geodynamics Research and Technology Development

W83-70505 676-01-01

Goddard Space Flight Center, Greenbelt, Md GEODYNAMICS INVESTIGATIONS SUPPORT

E Welker 301-344-6753

The objective is to provide technical and financial management support to AN's (university grants and private contracts) in the geodynamics discipline. The approach is to initiate, monitor, and report on research activities conducted for sponsorship of the geodynamics application notice

W83-70506 676-10-10

Jet Propulsion Laboratory, Pasadena, Calif. REGIONAL CRUSTAL DEFORMATION

S Saunders 213-354-3815

The objective of this research is improved understanding of Southern California tectonics from a local scale of individual faults to large-scale strains and block movements. The approach is by analytic modeling using a continuum approximation and by two- and threedimensional finite element modeling. Relevant geological and geophysical data will be compiled and evaluated for constraints on the analytic models

W83-70507 676-30-05

Jet Propulsion Laboratory, Pasadena, Calif. LITHOSPHERIC STRUCTURE AND EVOLUTION

S F Daly 213-354-4203

The objective of this research is to provide understanding of the properties and structure of the lithosphere and to understand the interaction between the lithosphere and convection in the Earth's mantle Work will continue in the study of gravity and surface topography due to convection in a variable viscosity medium. Magma ascent through the lithosphere in the form of diapirs will be studied. Numerical techniques will be used to construct quasi-three-dimensional models to study the effect of a moving lithosphere and a subducting slab on the properties of temperature dependent viscosity convection. Problems related to the variation of lithosphere properties with depth will be addressed by employing finite element techniques to model motions using the geometric and material property constraints at moving plate boundaries with periodic earthquakes

W83-70508 676-40-01

Jet Propulsion Laboratory, Pasadena, Calif. GRAVSAT STUDY

W L Sjogren 213-354-4868

The objective of this effort is to develop a new data reduction technique for producing a gravity field from satellite-to-satellite tracking data as currently proposed for the GRAVSAT Mission. The work will be done in collaboration with W. M. Kaula at UCLA. A primary benefit from this task will be significant reductions in the costs of extracting the gravity field

W83-70509 676-59-10

Goddard Space Flight Center, Greenbelt, Md GEOPOTENTIAL RESEARCH MISSION (GRM) GRAVSAT/MAGSAT

T Keating 301-344-8613

(676-40-01)

The objectives are to (1) conduct system studies of the Geopotential Research Mission (GRM), (2) investigate magnetometer instability, and (3) develop data processing software to establish benchmark capabilities of the mission designed to measure the Earth's gravity and magnetic fields to an accuracy exceeding the present capability. System studies will determine the complex relationship of the Doppler tracking, the DISCOS, the propulsion, and the magnetometer boom. Investigation of the lamp instability of the magnetometer will be performed Software conversion from the IBM 360 machines to the Cyber 205 will be continued The studies and software conversion will yield benchmark results that will allow project definition assuring successful measurement of the Earth's gravity and magnetic fields

W83-70510 676-59-30

Jet Propulsion Laboratory, Pasadena, Calif SERIES - SATELLITE EMISSION RANGE INFERRED EARTH SURVEYING

L E_Young 213-354-5018

The objective of this RTOP is threefold. The first is to demonstrate the current SERIES technology as a practical, cost effective conventional geodetic tool. The second is to bring the technology to the point where it is ready for implementation in a Caribbean basin cooperative geodetic program. The third objective is to demonstrate a remote automatic geodetic monitoring system. The current SERIES system makes use of the characteristics of the C/A and P codes of the Global Positioning System (GPS) satellites to deduce differenced GPS ranges to a ground network of receivers, without requiring knowledge of the GPS codes Simultaneous measurements of the ionospheric delays are also made within the SERIES receivers Performance of the current SERIES technology in measuring baselines will be verified over known baselines The system will be made ready for implementation as a tool for regional geodesy by demonstration of the ability to remove GPS orbit uncertainties from the baseline solutions and by removing the need for a steerable antenna For a remote geodetic monitoring system, the capability for remote control and long term unattended operation will be added to the SERIES receivers

W83-70511

676-59-33

Marshall Space Flight Center, Huntsville, Ala SUPERCONDUCTING GRAVITY GRADIOMETER Eugene W Urban 205-453-5132

The objective of this RTOP is to demonstrate the feasibility of a three-axis superconducting gravity gradiometer for space flight that is capable of measuring gravity gradients along three mutually perpendicular axes with a sensitivity of 0.01 EU or better A single-axis unit will be completed and tested, and a three-axis engineering unit will be designed, fabricated, tested, and refurbished for a possible Shuttle test flight

W83-70512

676-59-41

Marshall Space Flight Center, Huntsville, Ala
SHUTTLE TIME AND FREQUENCY TRANSFER EXPERIMENT
(STIFT)

R Decher 205-453-5130

The objective of this RTOP is to define a demonstration experiment using a Hydrogen Maser Clock onboard the Shuttle for global, high-accuracy time and frequency transfer Microwave and laser signals will be transmitted between the space vehicle and ground stations to compare the space-borne clock with ground-based clocks. Accuracy of frequency transfers in the order of one part in 10 to the 14th power, and time synchronization to within 1 nanosecond, are to be demonstrated

Resource Observation Applied Research and Data Analysis

W83-70513

677-21-24

Goddard Space Flight Center, Greenbelt, Md
RENEWABLE RESOURCES FIELD RESEARCH AND SPACECRAFT
DATA ANALYSIS

Robert E Murphy 301-344-7282

The overall objective is to develop and apply data interpretation techniques to the study of renewable resources problems. Particular emphasis is placed on techniques which utilize data from instruments with resolutions which are either higher or lower than the standard multispectral scanner (MSS) resolution of 80 meters (High spatial resolution studies are in support of the thematic mapper and future systems such as the multispectral linear array. Low resolution studies are in support of observing systems such as the advanced very high resolution radiometer on the NOAA satellites) Additional subobjectives include development of analytical techniques and instruments for ground truth measurements and the establishment of field measurement data sets. Data sets consisting of existing geographical data, field measurements under controlled conditions and aircraft data are acquired and compared with spacebased data as appropriate to assess land cover status, land use practices. The impact of various instrument parameters on determining land cover status etc. is assessed. Algorithms for analyzing these data are adapted or developed

W83-70514

677-21-25

Jet Propulsion Laboratory, Pasadena, Calif LAND COVER MULTISENSOR ANALYSIS

N A Bryant 213-354-7236

It is the purpose of this task to advance the state-of-the-art of resource management analysis and planning activities by developing software and procedures that integrate and interpret a variety of remotely sensed data types (visible, SWIR, SAR) and collateral data to analyse land cover in urban/suburban regions. It is expected that the products of this research will help NASA focus upon the more pertinent parameter requirements for geometric and classification accuracy on future missions and associated SRT areas in land resources. Improvements in the capability

to map and integrate remotely sensed data into land resources data bases are being pursued by (1) developing procedures and software which integrate remotely sensed data with other collateral data into models which assess potential land capability under varying constraints to land use, (2) developing in FY-81 and supporting in FY-82 the analysis of research data sets of the Los Angeles area composed of registered multi-frequency, multi-temporal and multi-sensor data sets in conjunction with National Science Foundation research sponsorship, (3) continuing the analysis of SAR responses to land cover mapping by incorporating scatterometer measurements and modelling reflectance properties of Los Angeles area urban and near-urban land cover types, (4) determining the incremental improvements in urban land cover classification accuracy achievable from a registered set of specified sensors for each level cover type identification, and subsequently merging the stratified classifications, and (5) testing and evaluating the environmental improvement achieved by the TM over MSS in land cover classification using simultaneous MSS and TM acquisitions from LANDSAT-D (ER-2 overflight and MSS acquisition backup if required). Each of the development areas will make use of airborne, high-resolution digital data where available Emphasis will be upon the integration of the future satellite image simulations and ancillary data to test the improvement potential for land resources mapping

W83-70515

677-21-26

Ames Research Center, Moffett Field, Calif

THEMATIC MAPPER SIMULATOR LAND RESOURCES STUDIES IN WESTERN ECOZONES

R C Wrigley 415-965-6060

(677-21-25)

The objectives are to evaluate the impact of thematic mapper (TM) data on classification accuracy and resource identification in Western ecozones, and evaluate TM as one stage, along with LANDSAT Multispectral Scanner (MSS), in a multistage sampling approach for the inventory and mapping of irrigated croplands and major crops over arid and semi-arid regions of the West. The approach will be to acquire ground, TM or thematic mapper simulator (TMS), and LANDSAT MSS data sets for forest, urban and agricultural regions in California Classification accuracy will be evaluated as a function of sensors, the analysis process employed, and the level of thematic information extracted using a standard contingency table approach to performance evaluation Existing clustering and classification algorithms from in-hand software systems will be evaluated in terms of their ability to handle TMS data The spectral and spatial information content of TMS data will be assessed through the examination of measured irradiance values, textural transforms and statistical separability measures. A technique for selecting optimal TMS waveband combinations for variable resource mapping tasks will be developed using statistical separability measures. Texture measures will be examined as a classification tool. For Western agricultural applications, classification accuracy vs. cost factors will be used to evaluate TM/TMS data as (1) a single resource, (2) combined with sampled ground data, (3) combined with MSS, and (4), as a part of a total ground/TM/TMS system design

W83-70516

677-21-28

National Space Technology Labs . Bay Saint Louis, Miss MULTISENSOR TECHNIQUE DEVELOPMENT

E F Zetka 601-688-3830

The objective is to conduct research, utilizing a number of different sensors and analysis methods, to determine basic remote sensing factors/parameters associated with land surface cover, and develop techniques to better discriminate and delineate those land cover forms. The RTOP is comprised of four tasks (1) utilize the airborne thermal infrared multispectral scanner to obtain and analyze the quantitive measurement of surface vegetation temperature in the 8 to 12 micron region, and examine D-thematic mapper (TM) mid-IR channels for vegetation water content characteristics, (2) analyze Shuttle imaging radar-A data over an Alabama study site to determine which basic physical and/or biological properties of land cover have the most effect on microwave radar return, (3) evaluate quantitative statistical approaches to reduce the data channel dimensionality of soon to be acquired TM data, and (4) determine the contribution new wavelength regions (e.g., 155 to 2.35 m) will have on the analysis of natural plant communities, as well as in non-natural vegetated areas, under stressed conditions

W83-70517

677-21-29

National Space Technology Labs , Bay Saint Louis, Miss LAND RESOURCES APPLIED RESEARCH

Armond T Joyce 601-688-3830

The general objective is to develop new and/or improved techniques to increase the accuracy and/or information about land resources that can be derived from remotely sensed data. This general objective is addressed through four specific applied research tasks which correspond

to the following objectives (1) develop and test technique using remotely sensed data to monitor and assess the degradation process and its indicators in semi-arid areas, and to develop and apply predictive models of degradation processes (2) determine and evaluate what information pertinent to the discrimination of surface mines as small, heterogeneous features can be derived from present and future space-acquired data, (3) develop remote sensing techniques capable of delineating soils in a manner which would serve to expedite the preparation of highter order soils surveys, and (4) conduct and coordinate NASA remote sensing research with selected National Science Foundation long-term ecological research projects. All four objectives will be pursued using thematic mapper (TM) simulator, LANDSAT TM, and LANDSAT multispectral scanner data. In addition synthetic aperture radar and thermal infrared multichannel scanner data will be brought to bear on the second and fourth objectives

W83-70518 677-21-30

Lyndon B Johnson Space Center, Houston, Tex LAND USE AND TECHNIQUES FOR MONITORING LARGE SCALE CHANGE IN BIOMASS

M C Trichel 713-483-6451

The objectives are to (1) develop and evaluate remote sensing oriented strategies for sampling and aggregation which support regional and global scale inventories of surface biota and monitoring of their change through time, (2) develop and evaluate remote sensing technologies which support regional and global scale inventories of surface biota, and(3) develop and evaluate remote sensing technologies which support regional and global scale monitoring of change in surface biota The basic technical approach will be to develop remote sensing technology tools and a general technological framework for regional and global remote sensing of surface cover particularly vegetation. The strategy will be to develop remote sensing information extraction tools for detecting and quantifying the state of the global environment with minimal ground data collection requirements while pursuing a more detailed understanding of the more specific information needs and levels of detail. Since a major indicator of the ecological transformation processes which occur in an area is that due to changes in general land use characteristics, emphasis will be given to the development and testing of sampling and estimation strategies for detecting and estimating these land use changes

W83-70519 677-22-27

Goddard Space Flight Center, Greenbelt, Md
HYDROLOGIC INFORMATION EXTRACTION TECHNIQUE DEVELOPMENT

A Rango 301-344-5480 (677-29-05)

The objectives are to (1) develop and test snowmelt runoff estimation and snowpack properties monitoring techniques in support of the U.S./Japan research project and evaluate models in domestic and foreign basins (2) develop and test remote sensing evapotranspiration techniques in support of the US/Japan research project, (3) use microwave techniques to develop a method for determining the hydraulic conductivity of soils, and (4) develop techniques for measuring watershed physiography with thematic mapper type data for input to hydrologic models. The approach will be to exchange models and data and conduct joint analysis and reporting of snowmelt runoff modeling and snowpack characterization with Japanese co-investigators, and evaluate snowmelt runoff model simulations by comparing predicted versus measured flows. Howard University will test satellite capabilities in Himalayas Energy balance models and satellite data will be exchanged with Japanese co-investigators and tested using surface temperature and soil moisture information Microwave-based models for estimating hydraulic conductivity of soils will be developed and validated with data from sites in Maryland and Texas The TMS thematic mapper capabilities for extracting watershed features over basins previously mapped with MSS data will be assessed

W83-70520 677-27-01

Goddard Space Flight Center, Greenbelt, Md MULTISPECTRAL LINEAR ARRAY FOR REMOTE SENSING W L Barnes 301-344-8117 (677-29-06, 677-26-14)

The objectives are to demonstrate the required multispectral linear array focal plane technology for resource observations in the visible/ near infrared (VIS/NIR), shortwave infrared (SWIR) and thermal infrared (TIR) spectral regions, to develop a science basis for system performance criteria and to develop associated pacing technologies. To develop the SWIR focal plane, two contracts will be awarded for a forty-two month development program. During the first phase, each contractor will demonstrate a SWIR module as the basic building block of the focal plane The second phase will develop a fully populated focal plane Supporting science and engineering studies will be continued to develop a science basis for system performance parameters and to advance associated pacing technologies in the areas of passive radiative coolers, optics, calibration, photovoltaic TIR arrays, monolithic SWIR technology, VIS/NIR focal plane development and data processing trades. This RTOP supports LANDSAT, Shuttle payloads, and an advanced land observing system. These in turn support the following objectives. (1) renewable and nonrenewable resource observations, (2) environmental observations, and (3) disaster assessment

W83-70521 677-29-05

Goddard Space Flight Center, Greenbelt, Md

SOIL/SNOW MOISTURE RESEARCH AND ASSESSMENT MISSION STUDY

Harry Montgomery 301-344-8033

The objective is to define mission requirements, instrument options, and feasible system concepts for a soil/snow moisture research and assessment mission that can be adapted to the Shuttle or the future space platform/station. The recently formed science working group will define and evaluate the requirements for satellite remote sensing measurements of soil and snow moisture. A study of various instrument options that are responsive to those measurement requirements will then be made to form the basis of the study of feasible system concepts The results of these system concept studies will be iterated with the working group to assure compliance with the requirements. The space Shuttle and space platform/station will be considered as possible alternatives. The need, if any, for new technology to support the mission will be research programs of NASA and other agencies. User needs, mission requirements instrument configuration, system concepts and required new technology will be documented

W83-70522 677-29-12

Jet Propulsion Laboratory, Pasadena, Calif. DIGITAL TOPOGRAPHIC MAPPING MISSION REQUIREMENTS/ FEASIBILITY STUDY

M Kobric 213-354-4631

The overall objectives are a determination of the requirements for digital topographic mapping of the Earth, and a definition of the sensors needed to achieve such a capability during an orbital mission. An evaluation of the various sensors and techniques available for digital mapping will be performed. These include, but are not limited to (1) photographic stereo, (2) synthetic aperture radar stereo, (3) multi-spectral stereo (radar-photo hybrid), (4) radar altimetry, (5) synthetic aperture radar interferometry, and (6) scanning laser altimetry. Error and efficiency analyses will be performed for each of these, and new technology requirements will be identified A users working group comprised of individuals representing a cross section of universities, industrial and government agencies will develop a set of requirements for a digital topographic mapping mission. This group will specify scientific requirements such as horizontal and vertical resolution, swath width or areal coverage identification of high priority targets, overlap with LANDSAT/ other data bases, data products and data processing and distribution In light of the recommendations of the UWG and technical results of the sensor studies, a candidate design for a first topographic mapping mission will be identified. The parameters to be specified include sensor type and configuration, orbit parameters, mission length, data processing and product requirements, orbital platform and the implementation of a data processing and distribution system

W83-70523 677-29-12

Jet Propulsion Laboratory, Pasadena, Calif. DIGITAL TOPOGRAPHIC MAPPING MISSION REQUIREMENTS/ FEASIBILITY STUDY

M Kobrick 213-354-4631

The overall objectives are a determination of the requirements for digital topographic mapping of the Earth, and a definition of the sensors needed to achieve such a capability during an orbital mission An evaluation of the various sensors and techniques available for digital mapping will be performed. These include, but are not limited to (1) photograhic stereo, (2) synthetic aperture radar stereo, (3) multi-spectral stereo (radar-photo hybrid), (4) radar altimetry, (5) synthetic aperture radar interferometry, and (6) scanning laser altimetry. Error and efficiency analyses will be performed for each of these, and new technology requirements will be identified A users working group comprised of individuals representing a cross section of universities, industrial and government agencies will develop a set of requirements for a digital topographic mapping mission. This group will specify scientific requirements such as horizontal and vertical resolution, swath width or areal coverage identification of high priority targets, overlap with LANDSAT/ other data bases, data products and data processing and distribution In light of the recommendations of the UWG and technical results of the sensor studies, a candidate design for a first topograhic mapping misson will be identified. The parameters to be specified include sensor type and configuration, orbit parameters, mission length, data processing and product requirements, orbital platform and the implementation of a data processing and distribution system

677-29-14

Jet Propulsion Laboratory, Pasadena, Calif
SPACE STATION RESOURCE OBSERVATIONS PAYLOAD STUDY J B Cimino 213-354-4631

The objectives are to (1) define a concept for utilizing advanced sensor systems on space station missions for Earth Resources investigations, (2) determine the mission requirements within the framework of anticipated space station engineering capabilities, (3) define a set of synergistic instrument complements to satisfy scientific requirements for selected experimental missions, and (4) provide guidance for the evolving design to assure maximum science output. The results of this study for FY-82 are based on a set of science discipline objectives in the area of Earth resources for which a space station could be utilized Specific mission requirements to be studied include orbits (altitudes and inclinations), observation cycles, experimental lifetime, spectral bands, and spectral and spatial resolutions. Three experimental payloads were chosen and operating modes (instrument integration, observation cycle, data acquisition, etc.) were investigated. Inasmuch as these studies are based on the Marshall Space Platform concept, the mission requirements defined will require revision as the space station concept itself is redefined or refined It is important that the Earth and Planetary Exploration Division office has a plan for the use of the space station and understands its advantages and disadvantages if it is to be a potential user

W83-70525

677-29-17

Jet Propulsion Laboratory, Pasadena, Calif. ATTITUDE TRACKER FEASIBILITY STUDY

F C Billingsley 213-354-2325

Line array sensors produce data which has no inherent geometrical continuity, hence, any platform attitude variation will be evidenced as a distortion when the data lines are displayed in the normal Cartesian raster Ancillary sensing is required to establish the platform attitude to allow geometric rectification. This is normally provided by inertial or star reference attitude sensors. In the absence of such sensors or if performance of them is degraded, the required attitude information is lost A strawman sensor design is proposed which utilizes small image areas on the ground to provide a series of motion vectors with which the platform attitude can be tracked, this allows the distorted image received by the normal image line sensor to be rectified. The first year work is a theoretical study leading to a potential set of parameters for later implementation. It will be accompanied by a simulation using MSS or TM data. If the theoretical study so indicates, the simulation will be followed by a photographic mock-up using geometry more close to the eventual configuration, and later an all-electronic prototype system These will occur after the first year

W83-70526

677-29-18

Jet Propulsion Laboratory, Pasadena, Calif ADVANCED RADAR CONCEPTS AND SYSTEMS STUDY F K Li 213-354-2849

While the presently planned spaceborne active microwave experiments, such as SIR-B and SAMEX, will provide essential radar measurements, they will not provide complete measurements of the target radar signatures as a function of frequency in addition, other interesting features, such as target altitude, will not be obtained by these systems. The objective of this RTOP is to perform preliminary system design studies for several advanced radar systems that will provide information complementary to the planned systems. Most of these advanced systems will be designed to operate on the Shuttle The performance of these systems will be evaluated by analysis and computer simulation. Any technology development that is critical to the implementation of these designs will be identified. In each fiscal year, two to three advanced radar system concepts will be selected for study System designs that meet the requirements identified by the scientific communities will be formulated. The expected results are documents summarizing these designs. These documents can then serve as initial guidelines for future mission studies. In FY-83, three specific radar systems will be studied (1) an imaging radar spectrometer which can provide high resolution imagery at a multitude of frequencies, (2) an interferometric SAR system that can generate altitude information for every pixel in an image and (3) a medium resolution radar operating at the frequency range of 30-40 GHz

W83-70527 Jet Propulsion Laboratory, Pasadena, Calif 677-29-22

LUMINESCENCE DETECTOR FROM SPACE James B Breckinridge 213-354-6785-

The objectives are to verify that a technique based on luminescence in the Fraunhofer lines is useful for distinguishing material from orbital distances, investigate the applicability of radiation in other absorption lines, and develop a design approach for an optical system for remote sensing of luminescence using Fraunhofer lines. Laboratory experimentation on geological material and standard phosphors will be carried out using available spectrometers to determine luminescent spectra and efficiencies Excitation spectra typical of solar radiation at the Earth's surface will be employed Standard phosphors can be expected to place upper limit on expected differences under these conditions. Some field samples will be analyzed using laboratory technique to determine luminescent components and dilution levels expected in practice. Building on this experience, the efficacy of this method for use in orbiting Earth observations will be verified Quantitative luminescence efficiency measurements will be used to calculate more accurate signal-to-noise ratios and probabilities for detection. Optical systems engineering skills will be applied to detail a design approach, selecting among imaging spectrometers if available, an imaging spectrometer will be used to record a picture of geological features luminescing in Fraunhofer lines Atmospheric effects on the SNR will be examined

W83-70528

677-29-23

Goddard Space Flight Center, Greenbelt, Md LONG WAVELENGTH SUBSURFACE SOUNDER

J D Oberholtzer 804-824-3411

The objective of this RTOP is the development of an electromagnetic system capable of remotely performing a geological subsurface sounding. The requirements, concepts, and critical technologies must be defined for this development. A multifrequency eletromagnetic signal is transmitted into the Earth, and the signal scattered back into the detectors is analyzed to detect conductivity anomalies. The variation of signal penetration with frequency provides a depth measurement. The necessary operating characteristics of the instrument are to be identified for use on platforms at the highest practicable altitudes. During the course of this RTOP, as technological barriers appear that might limit the development of this system, the critical needs for further research and development will be identified

W83-70529

677-41-03

Jet Propulsion Laboratory, Pasadena, Calif IMPROVED ROCK TYPE DISCRIMINATION

A B Kahle 213-354-7265

(677-41-22, 677-41-23, 677-41-14, 677-41-16, 677-41-17, 677-41-

The objective of this program is to develop an improved capability to discriminate among rock materials (rocks and rock weathering products, including soils) using remote sensing techniques to infer composition, mineralogy and litholog from spectral reflectance and emittance properties in the 0.4 microns to 14 microns spectral region. The approach is to acquire data in the 0.4 microns to 14 microns region of the spectrum in the laboratory, on the ground, from aircraft, and from satellites. Existing field instruments will be used in a continuing effort to determine the influence of variable environmental conditions (e.g., soil moisture, vegetation, atmospheric water vapor) upon remotely sensed data Trade-offs among spatial resolution, spectral resolution, and radiometric precision will be evaluated in terms of effects on discriminability of common rock types. Data analysis techniques will be developed as Specific topics to be studied include (1) evaluation of data required acquired during FY-82 in visible-near infrared wavelengths over sites in the Sierra Nevada batholith, the Idaho batholith, Mountain Pass, and other regions, (2) selection and analysis of a new geologic area using combined data sets from the three NASA thematic mapper simulators (TMS), and the thermal infrared multispectral scanner, the high spectral resolution airbone imaging spectrometer, and also the thematic mapper if data are available, (3) analysis of in situ emissivity measurements obtained with the portable field emission spectrometer during the 1982 field season, and comparison with laboratory measurements performed on field samples under controlled conditions (4) evaluation of the sensitivity and radiometric precision of the three NASA TMS, and a systematic study of the effects of spatial resolution on the geologic utility of multispectral images, (5) continued compilation, documentation, and publication of the large spectral data base, now containing many thousands of field spectra, and (6) continued evaluation of the utility of thermal inertia data for geologic applications, as determined from aircraft, HCMM, and field instrument data

W83-70530

677-41-13

National Space Technology Labs , Bay Saint Louis, Miss HYDROTHERMAL ORE SYSTEM DETECTION IN PARTIALLY VEGETATED, MOUNTAINOUS TERRAIN

D L Rickman 601-688-3830

It will-be-the-purpose of-this project to determine the utility of- --- --

thematic mapper data (initially through simulation) in the detection and mapping of hydrothermally altered characteristics of specific ore systems in extremely rugged terrain and mixed degrees of vegetative cover. A second objective will be to use the data for lithologic mapping. Supporting both objectives, TM(S) data will be integrated with other geologic data sets and evaluated for their utility as a coherent whole. Thematic mapper simulator data has been acquired over the Mt Emmons, Colorado, molybdenum ore body and the mountainous adjacent areas. Topographic effects are expected to be significant in all subsets of the data. The data will be integrated with digital elevation and, if available, geochemical and geophysical information supplied in part by AMAX, Inc. Areas of total, mixed, and zero vegetative cover will be separated and processed independently using different techniques. In areas of total vegetative cover, the distribution of flora will be modelled in terms of elevation and aspect with a 'geology' residual and then computed Barren areas will be treated by band ratioing and canonical analysis. Upon completion of the separate processing, the subsets will then be recombined The primary computer products should be lithology, alteration, and vegetation maps for the area. These will be analyzed for the utility of TM-type data under these conditions in providing significant geological information

W83-70531 677-41-14

Jet Propulsion Laboratory, Pasadena, Calif

HIGH SPECTRAL RESOLUTION TECHNIQUES FOR GEOLOGIC MAPPING

A F H Goetz 213-354-3254 (677-41-03, 677-41-77)

This work addresses one part of a continuing program at JPL to advance the state-of-the-art in geologic remote sensing. The overall objective of this program is to develop methods of discriminating among and identifying geological materials on the basis of their composition, mineralogy, and lithology through the use of narrow-band multispectral remote sensing measurements in the visible and infrared wavelength regions of the electromagnetic spectrum. Three new instruments will be used to facilitate research in high-resolution remote sensing (1) During the latter part of FY-82, the thermal infrared multispectral scanner (TIMS) will have been completed and calibrated at JPL In addition, test flights over the Tintic. Utah site will have been completed. These tests will be analyzed and the important TIMS instrument parameters will be characterized. The results will be documented and published (2) In FY-82, the airborne imaging spectrometer (AIS) will be completed and initial testing begun. The AIS will provide 128 spectral channels in the 12-24 micrometer region for each of 32 spatial channels across the flight track in FY-83 initial testing will be completed on a Dryden DC-3 and thereafter the instrument integrated into the C-130 platform (3) A new instrument, the portable instant display and analysis spectrometer (PIDAS) will be constructed and tested. Two versions of this instrument will eventually be fabricated, one for the 04-11 micrometer region and one for the 1-25 micrometer region

W83-70532 677-41-16

Jet Propulsion Laboratory, Pasadena, Calif OIL AND GAS TEST CASE STUDY H R Lang 213-354-3440 (677-41-03, 677-41-14, 677-41-04, 677-48-03 677-80-

The primary objectives are to (1) demonstrate that useful information for geologic/geobotanical mapping can be obtained through the analysis of data acquired by state-of-the-art remote sensing techniques. (2) evaluate the utility of current remote sensing technology for geologic mapping of a known oil and gas occurrence characterized by hydrocarbon seepage, and (3) develop recommendation for the design of aircraft/spacecraft remote sensing systems that could supply data to meet the information requirements of economic geologists involved in oil and gas exploration. The general approach is to continue the ongoing investigation of the Lost River, West Virginia test site, including the enlarged regional study of the south-central Appalachians in order to evaluate the cause of cross-strike structural discontinuities which may have a controlling influence on the surface expression of underlying oil and gas reservoirs. Geobotanical studies will be continued within the test site for the purposes of enhanced geologic mapping and the evaluation of potential seepage induced geobotanical anomalies. The investigation of oil and gas seepage phenomena associated with the Pico anticline oil and gas field area of southern California will continue

W83-70533

Jet Propulsion Laboratory, Pasadena, Calif CHROMITE TEST CASE STUDY

M J Abrams 213-354-6927

(677-42-05)

19)

The main objective of this study is to evaluate the utility of remote sensing techniques for geologic mapping in areas of known chromite

677-41-17

and nickel occurrences. Other objectives are to (1) determine the ability to discriminate various ultramafic rock types, (2) study the association of vegetation species/communities with rock type, and (3) identify possible vegetation anomalies due to substrate chemistry. The test site area is located in northern California/southern Oregon in the Josephine Ophiolite Complex Mineral deposits are associated with ultramafic rocks which consist of dunite wehrlite, harzburgite, and serpentinite. The site has moderate relief, and vegetation cover varies from 20 to 30% to 100% Further computer image processing at JPL's image processing laboratory will be performed on the two aircraft multispectral scanner data sets obtained during FY-82 and data to be acquired in October, 1982 The NS-001 thematic mapper simulator (TMS) data and MSS 11-channel data will be co-registered to a topographic base. Geologic maps will be digitized and registered to the same base. This combined data set will provide the remote sensing data which will be examined for geologic and geobotanical information related to rock type discrimination and vegetation mapping. The TMS aircraft data will be compared and contrasted with LANDSAT-D thematic mapper data if data is available during FY-83 Further field work will be undertaken to verify results from the analysis and interpretation activities. Anomalous areas will be visited to determine the cause of the image features. Field reflectance measurements will be obtained where necessary to supplement existing data Work will continue to be done in cooperation with Dr. D. Mouat at ARC and Dr M Podwysocki of the US Geological Survey, Reston Data exchange and synthesis of results in adjoining areas will allow a more regional study to be performed, without duplication of efforts

W83-70534 677-41-19 Jet Propulsion Laboratory, Pasadena, Calif.

SMIRR DATA ANALYSIS

A F H Goetz 213-354-3254

The objective of this effort is to continue to analyze, interpret and make ground checks' on the data from the Shuttle multispectral infrared radiometer (SMIRR) flown on STS-2. November 12 to 14 1982. The results of the analysis will be used to determine whether the 10 chosen spectral bands, spanning 0.5 to 2.35 microns can be used for the identification of surface materials worldwide. Special attention will be paid to areas covered by vegetation to gain information on the response of vegetation in narrow spectral bands beyond 1 micron Preliminary analysis of SMIRR data has shown that location of the radiometer field of view is accurate, the atmospheric transmission can be obtained by obtaining laboratory spectra of uniform areas covered by SMIRR, and clay and carbonate minerals can be identified in the orbital data Further work will concentrate on obtaining ground measurements in key areas and measuring the extent of atmospheric interference to direct identification of surface materials, and analysis of areas 100% covered by vegetation. Work will be carried out in conjunction with Dr. Lawrence Rowan of the USGS

W83-70535 677-41-23

Jet Propulsion Laboratory, Pasadena, Calif. GEOLOGICAL APPLICATIONS OF NEW REMOTE SENSING TECHNIQUES

A B Kahle 213-354-7265 (677-41-03)

The overall objective of this RTOP is to evaluate new types of measurement techniques for geological remote sensing. We will investigate the measurement capabilities of new technology, obtain experimental data as required, and evaluate the potential utility of new technology for geological applications. This will involve advanced studies of laboratory, field, and airborne instruments that could be fabricated in the future. Two activities will be undertaken this year, a test of active laser remote sensing and a design study for a field liminescence spectrometer We will evaluate the utility of laser reflectance measurements in the thermal infrared portion of the electromagnetic spectrum Experimental airborne data will be collected using an existing JPL CO2 laser over suitable different types of rocks and soils can be detected in laser reflectance measurements will be determined. A design study will be undertaken for a portable multispectral luminescence spectrometer that could be easily deployed in the field to measure solar stimulated luminescence within narrow wavelength bands in which natural solar radiation is reduced (i.e., so called Fraunhofer lines). The field device should be able to obtain spectral measurements at several different wavelengths in the visible and possibly the ultraviolet. A detailed cost plan for the actual fabrication of this instrument will be developed

W83-70536 677-42-04

National Space Technology Labs , Bay Saint Louis, Miss USE OF TM FOR THE DETECTION OF MINERALIZATION IN VEGETATED TERRAIN THROUGH INFERENCE OF GEOBOTANI-**CAL PARAMETERS**

W G Cibula 601-688-3830 (677-41-13)

The objective is to develop and evaluate practical techniques for using the thematic mapper (initially through simulation) and other air and spaceborne systems for geobotanical mapping. The emphasis will be on ore bearing terrains in areas which are moderately to heavily vegetated Geobotanical methods involve the use of surface vegetation to help identify the nature and properties of the substrate. The two aspects that are believed to be identified by remote sensing means are differences in plant community structure, and the effects of mineral stress in the plant community Data processing will include the development of spectral pattern recognition outputs, since pattern recognition is effective in emphasizing minute detail in spectral data and therefore is capable of finding subtle geobotanical relationships Field verification of results is central to the project. Concurrently, geological data from other sources will be obtained and compared to the spectral data map products

W83-70537

677-42-05

Ames Research Center, Moffett Field, Calif

REMOTE SENSING TECHNIQUES FOR GEOBOTANICAL DISCRIM-INATION OF CHROMIUM-BEARING ROCK TYPES D A Mouat 415-965-5896

(677-41-77, 677-42-01, 677-42-04)

The primary objective of this RTOP is to develop and evaluate techniques using remote sensing technology to discriminate parent materials associated with known chromite deposits using vegetation characteristics. These techniques are needed to improve rock type discrimination and mineral exploration. Immediate objectives include an assessment of sensors, analytical techniques, appropriate vegetation parameters, and the degree to which selected terrain features improve vegetation based techniques. An accuracy and efficiency comparison will be performed. The approach will consist of several facets. A study area and test sites will be selected so as to include chromium-bearing ultramafic rocks from the western belts of the Klamath Mountains in southwest Oregon The vegetation and terrain features will be examined and described in order to discriminate those parent materials. Aerial photography and thematic mapper simulator data will be acquired over the test sites. A second study area will be selected in an area of serpentine rock types in northern California. In that area Shuttle imaging radar-A imagery will be examined in order to differentiate serpentine rock types and associated mineralization on the basis of the associated vegetation. In both areas, several analytical techniques will be employed in the data reduction phase

677-42-07

Goddard Space Flight Center, Greenbelt, Md GEOBOTANICAL MAPPING IN THE EASTERN UNITED STATES E J Masuoka 301-344-5600

The objective is to evaluate the combined utility of state-of-the-art remote sensing techniques for geologic mapping in areas of moderate to dense natural vegetation. The approach will be to (1) select two regional test sites in the Applachian Plateau, Blue Ridge and Valley and Ridge which cover approximately 100 x 100 km, (2) compile orbital data previously collected over the test sites including LANDSAT, HCMM and SEASAT SAR, (3) register orbital data, geologic, botanical and geophysical map data to a topographic base, (4) analyze the combined data to determine the success rate for mapping specific geologic features under different combinations of season and physiographic province. (5) select 10 x 10 km test sites in each regional site that encompass several lithologies, have moderate to dense vegetation and possess geologic features which were recognized in the orbital data (6) collect thematic mapper simulator and thermal infrared multispectral data over the test sites at several points in the year concentrating primarily on the start of the growing season and leaf senescence, (7) collect detailed botanical, geologic and soil series observations at each site, (8) analyze the remotely sensed and ground truth data to assess the benefits derived by increased spectral and spatial resolution in the thermal infrared and quantify relationships between lithologic, soil, botanical and remote sensing variables in geobotanical mapping and (9) combine results from test sites at both scales to assess the potential for augmenting or replacing conventional ground based information with airborne and orbital data in the exploration process

W83-70539

677-43-16

Jet Propulsion Laboratory, Pasadena, Calif
USE OF SAR FOR GEOLOGIC MAPPING J P Ford 213-354-6735

(677-46-02 677-43-17)

SEASAT synthetic aperture radar (SAR) provided the first spaceborne radar images of the Earth for scientific applications in 1978. The images were acquired with a 20 deg incidence angle over most of North America, and parts of the Caribbean and western Europe The Shuttle provided a second generation of spaceborne SAR images in 1981 The images were acquired with a 50 deg incidence angle over selected portions of each continent except Antarctica The objectives of this RTOP are to analyze the data from the SEASAT and the Shuttle Imaging Radar (SIR-A) missions, to evaluate the utility of imaging radar data for purposes of geologic mapping and interpretation in different selected geologic/geomorphic environments and to utilize the findings in support of experiments in geologic mapping to be performed with SIR-B This evaluation includes the use of airborne SAR images, scatterometer data and corresponding coverage with spaceborne sensors in the optical and near infrared range of the EM spectrum for comparative purposes This proposal covers the three year period from FY-83 to FY-85 It represents the efforts of five researchers with the common objective of understanding the geologic and topographic information in SAR images, in conjunction with other remote sensing data, for applications in geologic mapping and interpretations. The approach is to conduct detailed studies of specific sites through a range of climatic environments from arctic through temperate to tropical, in regions that range from and to humid Emphasis will be placed on tropical regions and areas of extensive vegetation cover Quantitative measurements of feature perception relative to imaging geometry on SEASAT and SIR-A images will be used to determine the most desirable range of illumination conditions for the acquisition of corresponding coverage with the variable look angle and repetitive coverage capability of the SIR-B system

W83-70540

677-43-17

Jet Propulsion Laboratory, Pasadena, Calif TOPOGRAPHIC MAPPING METHODS M Kobrick 213-354-4631 (677-43-16, 677-46-02)

The objective of this study is to understand the applications of and optimum techniques for measuring topography from orbit. The study will determine the optimum incidence and convergence angles for both geologic interpretation and the production of topographic maps from radar stereo pairs. Specific tasks are to (1) extend the simulation technique to encompass the convergent stereo provided by Shuttle Imaging Radar (SIR-A), (2) develop an analytical theory and error analysis for convergent stereo, (3) continue production of topographic maps from SIR-A image pairs, (4) use simulations and SIR-A results along with orbit design and tracking constraints to determine the best possible stereo experiment for SIR-B in addition the research will assess the utility of combining radar images with those from other visible and infrared sensors for stereo analysis by (1) developing an analytical theory and error analysis for combining images from systems with disparate projection geometries. (2) attempting to produce topographic maps from SEASAT and SIR-A images combined with those from LANDSAT and aircraft photography, and (3) designing verification experiment using SIR-B and the large format camera. Finally, the study will determine how well various types of topography can be measured with a raster scanned, pulsed laser altimeter. Tasks here include. (1) continue laboratory measurements of the backscatter of various target materials to coherent radiation, (2) performing field tests using the laboratory equipment to assess the effects of range depth of natural terrain and varying amounts of natural and man-made background, and (3) completing a conceptual design for an orbital instrument and corresponding aircraft breadboard model

W83-70541

677-43-18

Jet Propulsion Laboratory, Pasadena, Calif SIR-A DATA ANALYSIS T H Dixon 213-354-4977 (677-46-02, 677-43-16)

The Shuttle Imaging Radar (SIR-A) acquired high quality radar imagery of a variety of geological environments around the earth. In order to maximize the scientific return from these data, it is proposed that a number of independant investigations be carried out. These studies would concentrate on critical geologic areas and would be conducted by non-NASA researchers familiar with the specific terrains and/or specific data analysis techniques. Two broad classes of investigations are planned The first would utilize SIR-A data over relatively well studied sites in the US and northern Mexico. In some cases these sites have two look directions of SIR-A data plus SEASAT coverage. These studies will concentrate on data analysis techniques, and sensor performance analysis. A key goal is to quantify the actual information return from SIR-A by comparison with existing ground truth and other remote sensing data. This will help define mission requirements for future sensors. A second type of investigation will be carried out in areas which are not well known geologically. In many remote areas of the earth, the SIR-A data represents the first available radar imagery. Investigations utilizing this data are expected to contribute to overall understanding of geologic processes in these regions.

W83-70542

677-45-06

Goddard Space Flight Center, Greenbelt, Md

CRUSTAL MAGNETIC FIELD REPRESENTATION AND VERIFICA-

R A Langel 301-344-6565

The major objectives of this program are to (1) verify the validity of reduction to pole techniques at the geomagnetic equator and continue optimization and development of the equivalent source software, (2) complete and publish the global POGO magnetic anomaly map, (3) identify, characterize, isolate and, if possible, model those external field effects in the MAGSAT data which contaminate the crustal anomaly measurements, and (4) investigate and apply techniques of filtering external fields from anomaly data and of selecting data in which such efforts are minimal and apply these methods to derive a revised MAGSAT anomaly map. Smoothing and accuracy criteria for equivalent source solutions will be developed and tested by comparison with data. Individual data plots from MAGSAT dawn and dusk, will be compared to each other, to POGO, and to existing external field pedictions. The apparent external fields will be identified and characterized and MAGSAT data selected to minimize these effects. Fourier and cross-spectral filters will be investigated to see if they improve the elimination of external fields Maps will be generated and published

W83-70543

677-46-02

Jet Propulsion Laboratory, Pasadena, Calif
NEW TECHNIQUES FOR QUANTITATIVE ANALYSIS OF SAR
IMAGES

D L Evans 213-354-2418 (677-43-16, 677-43-17)

Images from the Shuttle Imaging Radar (SIR-A), flown in November, 1981 were obtained for parts of North America, South America, Australia, Africa, and Asia SIR-A provides a complementary image data set to the SEASAT SAR because data were obtained from areas that were not covered by LANDSAT, and SIR-A images were obtained at a different incidence angle than SEASAT. The objectives of this RTOP are to develop and implement new techniques for quantitative analysis of spaceborne multi-incidence angle, airborne multipolarized and multifrequency SAR data. The approach will be to acquire multipolarized and multifrequency aircraft SAR data over areas covered by SIR-A and SEASAT in order to determine the effect of polarization, frequency, and incidence angle on image texture and tone, and how these parameters can best be used in mapping geologic units. This proposal covers the basic research effort at JPL involving the development and implementation of new techniques for analyzing SAR images for the three year period of FY-83, FY-84, FY-85 It represents the efforts of 4 researchers (3 professionals and 1 post doctoral researcher) who will be addressing techniques for various applications. The techniques developed under this RTOP will be used to define experiments needed to better understand and utilize data obtained by SIR-B at variable incidence angles, and future SAMEX missions with multipolarization and multifrequency capabilities

W83-70544

677-47-03

Jet Propulsion Laboratory, Pasadena, Calif AIRBORNE RADAR OPERATIONS

N Herman 213-354-2654
(677-47-07)

The objective is to provide and maintain an operational radar facility for NASA scientific experiments that pertain to the remote sensing of surface characteristics. Such experiments are to be conducted by NASA or NASA selected investigators. The facility will include the radar sensors and access to data processing facility and provide a full capability to respond to user requests. The CV-990 or C-130 aircraft assignments and costs are not being provided for in this RTOP in FY-83, the NASA-JPL L-band SAR will be brought to complete operational readiness and will be used to perform the scientific experiments. The system will be placed under configuration control. Supporting documentation will be completed for (1) maintenance, (2) operation procedures, (3) system performance and (4) experiment cost estimating will be completed Also in FY-83, the JSC scatterometer will be transferred to JPL where status and performance will be reviewed, the ongoing JSC work will be incorporated, and the L and C band scatterometers will be made operational in FY-84

W83-70545

677-48-01

Jet Propulsion Laboratory, Pasadena, Calif ER SEASAT DIGITAL SAR PROCESSING

T A Andersen 213-354-3964

The objective of this RTOP is to process SEASAT radar data to produce synthetic aperture radar images of land areas in North and Central America in support of Earth resource application investigation studies. The processing will be performed using the upgraded interim digital processor in JPL. Each image will exhibit a 25 meter resolution and cover a 100 km square target area. At least 20 images will be produced in FY-83.

W83-70546

677-48-03

Jet Propulsion Laboratory, Pasadena, Calif SPATIAL RADAR IMAGE REGISTRATION

M Naraghi 213-354-6116

The overall objective of this task is to develop SAR image registration methods with increased accuracy and a higher level of automation One of these techniques, which is based on a radar specific distortion model and incorporates digital topographic information in defining the geometric transformation, will be expanded to use all available and pertinent ephemens data. The key effort in this regard will be to fully automate this process so that the present preconditioning of the images, (i.e., rotating-scaling and de-skewing), will be a function of the information obtained from the radar system parameters and the few tiepoint locations The procedure will also be fully evaluated by applying it to areas of varied topography while measuring the registration error and developing methods to minimize it. A particular procedure which is to be pursued is that of improving the radar parameter estimates by using the information furnished by the tiepoints. Currently preprocessing methods are being considered in order to facilitate the difficult task of tiepoint identification One particular method currently under investigation is the development of a procedure to associate the saturated areas of the radar image to corresponding areas of the topographic data whose slopes are close to normal to the radar beam. In addition, texture, edge detection and various filters will be considered for final pixel to pixel association of the radar image and the topographic data

W83-70547

677-60-11

Ames Research Center, Moffett Field, Calif
DIGITAL MAPPING OF IRRIGATED CROPLAND

H W Jones 415-965-6616

The major objective is to develop and test digital LANDSAT techniques to map irrigated croplands within selected aquifers of the western United States. The irrigated cropland data required to estimate ground water usage will be generated for the USGS Regional Aquifer System Analysis and Water Use Programs. The RTOP will also involve research and test techniques to improve digital mapping of irrigated cropland. Crop calendar information will be used to select appropriate dates for mapping irrigated cropland. Data will be processed using the most accurate and rapid computer programs, and new programs will be developed to improve results and increase processing effectiveness. Multidate data will be overlayed, and all data will be registered to a map base. Accuracy will be checked using available ground truth data.

W83-70548

677-60-15

Ames Research Center, Moffett Field, Calif

REMOTE SENSING APPLICATIONS FOR FACILITY SITE SELECTION AND WASTE DISPOSAL IMPACT ASSESSMENT

D A Mouat 415-965-5896

The overall objective of this RTOP is to develop and test analytical techniques involving the characteristics of the thematic mapper to generate screens (or factors) for facility site selection and waste disposal impact assessment. Secondary objectives involve testing the dynamic range, spectral and spatial resolution of the thematic mapper in order to meet the overall objective. In order to test these sensor characteristics, new, improved and/or reformatted analytical techniques must be developed and evaluated. The multiphase approach involves the selection of test sites situated within diverse ecosystems which are well suited for waste disposal impact assessment and facility siting in coordination with Woodward Clyde consultants. The use of airborne scanner data to simulate the TM's sensor characteristics will occur prior to the availability of the thematic mapper data. The approach involves several analytical procedures. Optimal waveband combination will be accomplished in order to optimize separation of water features, semiarid land cover features, and geologic features. Various types of classification procedures will be attempted on the different data sets

W83-70549 677-60-19

Ames Research Center, Moffett Field, Calif

USE OF THEMATIC MAPPER DATA FOR ELECTRICAL UTILITY TRANSMISSION CORRIDOR ANALYSIS AND SITING

Ethel Bauer 415-965-5513

The objective of this project is to evaluate thematic mapper and thematic mapper simulator (TMS) digital data as a source for the identification and mapping of features impacting electric transmission line routing. The project will attempt to solve various problems previously noted when using LANDSAT MSS data in transmission line routing analysis. The approach will be to acquire TMS and ground data sets for agricultural, riparian, and rural urban regions in California Spectral clustering and texture analysis techniques will be developed and assessed for the identification of vineyards, tomatoes, and rice crops which affect transmission line siting. Edge/linear detection algorithms will be evaluated as tools for mapping the agriculture infrastructure. Contextural classifiers and texture techniques will be examined for effectiveness in riparian vegetation, small water bodies, and rural urban development mapping The above analyses of TMS data will be compared to previous results obtained using LANDSAT MSS in this application

W83-70550 677-80-22

Jet Propulsion Laboratory, Pasadena, Calif. IPL UPGRADE. INTERACTIVE DISPLAY/VIRTUAL ROAM R E Alley 213-354-5693

A set of four or more large (1024 x 1024 samples) refresh memories will be procured and integrated into the existing IPL nonrenewable resources interactive image display processor system. Using these newly acquired memories a virtual roam capability will be implemented in software. This capability will permit an interactive user to move the viewing window at will around an arbitrarily large scene by high data rate loading of unused portions of the memory in anticipation of user directed motion. In addition to supporting image examination, the resulting software can be integrated into other applications programs, such as training and registration

Sounding Rockets

W83-70551

879-11-38

Goddard Space Flight Center, Greenbelt, Md SOUNDING ROCKET EXPERIMENTS

W M Neupert 301-344-5523

The sounding rocket program provides unique capabilities to conduct a broad range of scientific investigations. The program is particularly important for the development and demonstration of the merit of new instruments for Shuttle flights and of prototype instruments for satellites. Furthermore, the short lead time and program flexibility make it possible to follow up new discoveries and to study particular phenomena on the Sun and in the Earth's atmosphere Extreme ultraviolet spectra of the Sun are a valuable tool for determining the true physical conditions in the solar corona. The main objectives are the determination of the flow of matter and energy from one region to another in the corona For this purpose the coronal density, temperature, gas velocity, and radiation field must be known. The work under this task is directed toward the development and flight on rockets of instruments for determining these four physical parameters in the corona A better determination of the characteristics of the solar corona is necessary in order to discover the paradoxical reasons why a coronal gas temperature of more than one million degrees can be maintained by energy from a region whose temperature is only five thousand degrees. These measurements are also important for determining the origin of the solar wind, which may arise from regions of open magnetic field

W83-70552

879-11-41

Goddard Space Flight Center, Greenbelt, Md

SOUNDING ROCKETS EXPERIMENTS (ASTRONOMY)

P Stecher 301-344-8718

The astronomical sounding rocket program provides a unique capability to conduct a broad range of scientific investigations. The program flexibility and short lead time make it possible to observe unusual physical phenomena for which satellite instrumentation is not available. The program flexibility makes it possible to expenditiously follow-up discoveries as well as to provide tests and calibrations of satellite instrumentation. This unique capability is exploited by obtaining one of a kind observations of those types of astronomical phenomena that do not need large amounts of repetitive data to delinate their physical processes. Many new types of observations are now possible because of recent technical advances in both attitude control and new detectors. These observations are necessary in order to understand and analyze many properties of the interstellar medium, stars, nebulae, and peculiar galaxies. The present objectives are to develop payloads to obtain ultraviolet images of the weak sources now accessible as a result of improved pointing devices. Old payloads will be improved and used again and new payloads will be developed to take advantage of modern sensors and image intensifiers. The properties of galaxies and peculiar galaxies will be studied by means of their ultraviolet images Procedures for absolute photometry of the stars and galaxies will be investigated. All instrument development will be done in such a manner that the instruments can be used on Spacelab or as SPARTAN (Shuttle Pointed Autonomous Research Tool for Astronomy)

879-11-46

Goddard Space Flight Center, Greenbelt, Md

SOUNDING ROCKET EXPERIMENTS (HIGH ENERGY ASTROPHYS-

E A Boldt 301-344-5853

High energy astrophysics (especially X-ray astronomy) is a rapidly evolving field of research, both scientifically and technically. The exploitation of the capabilities of short lead time, planning flexibility, accurate pointing and extremely high telemetry rates (most important) afforded by rocketborne experiments are major factors in the success to date, a vigorous elaboration of this activity is now necessary for continuing to make timely and important contributions that complement data from satellite missions and for the effective planning of advanced future missions (e.g., BBXRT, AXAF). This involves experiments with systems incorporating newly developed spectrometers and X-ray

OFFICE OF SPACE TRACKING AND **DATA SYSTEMS**

Advanced Systems

W83-70554

310-10-23

Goddard Space Flight Center, Greenbelt, Md SOFTWARE TECHNOLOGY

Frank E McGarry 301-344-5048

The objective of this RTOP is to identify, evaluate, and refine software engineering technology as applied to three disciplines of software development, management, and maintenance. The software engineering technology to be studied includes software methodologies (such as design techniques, structured implementation techniques, and design evaluation techniques), software tools (such as management support tools, code auditors and analyzers, and automated design tools), and software support models (such as resource estimation models or reliability estimation models) The identified methodologies are intended to significantly reduce the overall life cycle costs of the software within the mission and data operations area. The approach to attain the stated objectives includes the establishment of a laboratory environment through which the identified areas of software technology can be investigated, measured, and refined under suitable conditions. The laboratory will support the research effort in the area of software development, management, and maintenance Within the laboratory environment, candidate technologies will be identified, appropriate measures to be used in the evaluation process will be developed, a data collection scheme will be identified, and the experiments will be conducted where the candidate methodologies will be applied to software development and maintenance tasks. This is a systems level RTOP supporting the areas of Tracking and Data Relay Satellite System operations, mission support computing, and mission operations

W83-70555

310-10-26

Goddard Space Flight Center, Greenbelt, Md ATTITUDE/ORBIT TECHNOLOGY Arthur J Fuchs 301-344-6846 (506-61-06, 312-80-53, 310-40-46)

and orbit determination/prediction/analysis for both ground based and onboard application, including algorithms, techniques, software, and hardware. The trichnology developed under this RTOP supports the Space Tracking and Data System in the areas of mission computing and analysis, Tracking and Data Relay Satellite System operations, and data processing Various techniques, algorithms, and filters will be developed and evaluated for their applicability to automated and improved orbit and attitude

Develop, evaluate, and demonstrate new technology for attitude

determinations and control configurations. The configuration may be onboard or ground based. Another task will analyze various ground control point (GCP) processing algorithms, and design automated techniques for GCP registration Finally, onboard as well as ground based applications of microprocessor based orbit and attitude determination systems will be investigated

W83-70556

310-10-42

Goddard Space Flight Center, Greenbelt, Md PRECISION TIME AND FREQUENCY SOURCES S Clark Wardrip 301-344-6587

(644-03-05, 676-59-35)

The objectives of the RTOP are to develop improved frequency and time standards, to improve existing hydrogen maser frequency standards, and to develop associated time and frequency distribution and measurement systems for very long baseline interferometry and near Earth and deep space tracking. The NR masers will continue to be upgraded Major improvements planned are the evaluation of a quartz cavity liner and the construction of an integral quartz cavity design for the NR type maser. Testing and evaluation of the external bulb maser will proceed as soon as operation is achieved in this unit. Long term testing and operation of masers will be undertaken to develop the doctrine of operation necessary for long term stability performance. Automated measurement systems will be established under controlled environmental conditions to support these tests.

W83-70557

310-10-60

Jet Propulsion Laboratory, Pasadena, Calif

RADIO METRIC TECHNOLOGY DEVELOPMENT
P S Callahan 213-354-4753

(310-10-62, 310-10-63, 310-10-64)

The broad objective of this RTOP is development of advanced radio metric systems used by the Deep Space Network (DSN) for spacecraft navigation and radio science. The navigation requirements which will be placed upon the DSN by future missions are expected to be stringent (50 nrad) The techniques having the greatest potential for improved navigation accuracy utilize very long baseline interferometry (VLBI) The main development effort is focused on differential VLBI measurement schemes, referred to as delta VLBI. This method involves differencing measurements from a spacecraft and an angularly nearby extragalactic radio source (EGRS). Common mode errors in the measurements cancel to give precise EGRS relative position or position rate information. Near term goals are to (1) demonstrate a 50 nanoradian delta VLBI capability and (2) provide the technology development required for EGRS relative spacecraft navigation, such as identification of radio sources useful for navigation, demonstration of ways to establish the planetary ephemerides in the EGRS reference frame, and development of media calibration techniques. In addition to improved accuracy, reduced cost of navigation is an important consideration. Obtaining all six components of the spacecraft's position and velocity with the VLBI system to reduce both tracking and processing costs will be investigated. The development of special purpose systems of tracking high earth orbiters with increased accuracy and/or reduced costs will also be investigated. The VLBI data are used to support navigation thru the determination of earth platform parameters and EGRS positions. The long term goal is to develop a VLBI system capable of 5 nrad (23 cm) accuracy. Near term objectives include (1) demonstrate 1 cm delay measurements (instrumental precision) on a short baseline (2) demonstrate 2 cm tropospheric calibrations Other work under this RTOP provides extensions of VLBI correlator technology to support nonreal time arraying and antenna panel alignment A VLSI correlator will be developed

W83-70558

310-10-62

Jet Propulsion Laboratory, Pasadena, Calif FREQUENCY AND TIMING RESEARCH

R L Sydnor 213-354-2763

(310-10-60 310-10-61, 310-10-64, 310-10-68)

The thrust of this RTOP is the development of frequency and time standards, distribution systems and utilization equipment for use in the Deep Space Network (DSN) during the next decade. Accurate frequency and time are the basis for outer space navigation, for very long baseline interferometry based experiments, and for geodesy. The reliability and maintainability must be improved in order to decrease M and O costs and increase H maser availability to 99 9%. The goal is to improve the mean time between failures from 25 months to 5 years and the mean time to repair from 3 months to 3 weeks. In addition, the present frequency and timing performance of the DSN of 10 to the -14th power and 100 nsec must be improved by the mid-1980's to 3x10 to the -16th power and 10 nsec. The goal for the late 1980's and early 1990's is 10 to the -17th power and 1 nsec. New technology, such as trapped ion, superconducting cavities or cryogenic quartz oscillators, must be developed to achieve these goals. Redundant frequency standards are planned to achieve the high system reliability, so that means must be provided in the form of a Frequency Standard Selection and Control System (FSSCS) to achieve switching to alternate standards upon failure of the prime standard with minimum change of phase or frequency The goal is 10 to the -2nd power degrees of phase and 10 to the -15th power change in frequency Effective utilization of the high stabilities achieved by the frequency standards requires proision frequency and time distribution. Fiber optic and satellite distribution systems will be developed to disseminate these reference signals at distances from 10 meters to 20,000 km. The goal of the fiber optic system for 10 meters to 20 kilometers is 10 to the -18th power frequency stability and 0.1 nsec time stability. The goal for satellite time synchronization between the DSSs is 1 nsec. The capabilities of the end-to-end DSS to support these stabilities will be evaluated with a near term goal of meeting the 3x10 to the -15th power stability needed for X-band uplink

W83-70559

310-10-63

Jet Propulsion Laboratory, Pasadena, Calif SPACE SYSTEMS AND NAVIGATION TECHNOLOGY J Ellis 213-354-2788

(310-10-63)

The basic objective of this RTOP is to establish the anticipated navigation requirements for Deep Space Network (DSN) supported deep space and high earth orbiter (HEO) missions planned for the 1985-2000 era and to assess their implications on the DSN radio metric system Drivers for future development are the stringent navigation accuracies anticipated for outer planet and for planetary orbiter missions and the need for navigation concepts to enable support of low cost missions planned for the Mariner Mark 2 and Pioneer set. The RTOP identifies and evaluates radio metric data strategies and advanced navigation concepts capable of achieving these goals. A related activity is the development of prototype navigation data processing concepts to reduce mission operations costs and increase efficiency and reliability. Current goals of the navigation technology work units are to (1) establish radio metric data requirements for new navigation functions such as asteroid and comet orbiters. (2) develop orbit determination strategies to minimize navigation performance sensitivity to critical error sources such as instrument calibration errors and quasar position uncertainty, and (3) formulate and evaluate navigation concepts to enable support of low cost missions and expand the usage of DSN capabilities. The latter includes strategies which exploit delta very long baseline interferometry capabilities for deep space, HEO and TDRS navigation, application of space telescope observables to complement DSN radio metrics, and dual spacecraft tracking techniques. A complementary goal is to implement and demonstrate a prototype multimission navigation data processing facility on a dedicated VAX 11/780 The prototype system will serve as a foundation for the long range goals which are to develop high speed computer graphics capabilities, and initiate automated event driven operations and diagnostic procedures

W83-70560
Goddard Space Flight Center, Greenbelt, Md
NETWORK SYSTEMS TECHNOLOGY DEVELOPMENT

J Schwartz 301-344-7313

The objective of this RTOP is to investigate the applicability of new technology in the Tracking and Data Relay Satellite System (TDRSS) era Selected technology will be investigated by means of feasibility studies, prototype development and demonstration, and by cost and reliability impact studies A major goal is to investigate the effect of nonGuassian channel characteristics on TDRSS link performance and develop coding and signal designs which optimize link performance Associated with this goal is the objective of validating the analytical predictions by means of limited hardware simulations

W83-70561

310-20-38

310-20-33

Goddard Space Flight Center, Greenbelt, Md SATELLITE COMMUNICATION TECHNOLOGY

D D Wilson 301-344-5257

The objective of this RTOP is to introduce efficient high-rate digital telecommunications transport systems to support NASA programs by 1986 The work focuses on two major tasks whose objectives are to define and demonstrate an efficient multinode satellite-based digital telecommunications systems which can provide to geographically dispersed users multiple access on a common line, and to define and demonstrate advanced signal processing and coding techniques which could provide an improvement in data transmission speed and performance through 36 MHz C-band domestic satellite transponders. The approach for each task is as follows (1) define the system requirements and resultant network architecture, and then, develop and demonstrate the system elements including low cost implementation of time division multiple access (TDMA) terminals, maintenance and control terminals, digital voice Codec, forward error correction Codec, and transportable TDMA Earth stations (2) evaluate the feasibility of combining the best performance of signal processing and coding elements to provide 85 MB/S transmission through a C-band transponder at 1x10(-7) bit error rate and 99 5% error free seconds with specified satellite system characteristics

W83-70562

310-20-39

Goddard Space Flight Center, Greenbelt, Md VERY LONG BASELINE INTERFEROMETRY (VLBI) TRACKING OF THE TRACKING AND DATA RELAY SATELLITE (TDRS)

Philip E Liebrecht 301-344-7782

The objectives of this RTOP are to utilize very long baseline interferometry (VLBI) tracking of the Tracking and Data Relay Satellites (TDRS) as an independent measure with which to validate the TDRSS tracking capability, to demonstrate the application of passive VLBI techniques to improve TDRS trajectory determination, and determine the detailed requirements and specifications for an operational, dedicated, TDRS VLBI system A three phase approach will be used During the first phase, an experiment will be conducted to demonstrate the feasibility of the technique and provide data for comparison with the bilateration ranging transponder (BRTS) derived orbits. The second phase will involve formulating overall functional requirements and system analysis for a dedicated operational system leading toward the final phase which will develop complete detail system specifications for such a system

W83-70563

310-20-46

Goddard Space Flight Center, Greenbelt, Md

ADVANCED SPACE SYSTEMS FOR USERS OF NASA NET-WORKS

R P Hockensmith 301-344-9067 (506-61-26)

The objective of the work under this RTOP is to achieve technological advances in radio frequency (RF) systems, antenna systems and associated control technology, on board data storage systems, and in telecommunications coding. These developments will satisfy future requirements of user's of NASA networks (spacecraft and space transportation system payloads) that require near global coverage through communications relay satellite systems (Tracking and Data Relay Satellite System, Tracking and Data Acquisition System) for the support of the missions. The approaches for accomplishing the objective are to (1) identify the basic operational communication requirements, (2) investigate RF active and passive components and antenna systems that are feasible, but may be a technical risk, to attain the required RF performance, (3) investigate methods of reducing and controlling torque noise induced into space platforms due to electromechanical steering of large high gain antennas, (4) investigate methods of high density and high rate recording and storage (5) investigate improvements in telecommunication coding schemes for spacecraft generated data, (6) develop system designs incorporating these optimum subsystems to permit user projects to specify proven, reliable hardware with a high confidence level in the performance capability, cost, and required procurement cycle, (7) exploit necessary improvements in testing techniques that properly characterize these critical systems

W83-70564

310-20-64

Jet Propulsion Laboratory, Pasadena, Calif X-BAND UPLINK DEVELOPMENT Rob Hartop 213-354-3433 (310-20-65, 310-30-68, 310-30-70)

The objective of this RTOP is the development of a phase-stable multi-kilowatt automated wideband uplink capability at X-band for future Deep Space Network (DSN) missions. This objective is being met by the development of 20 KW transmitter system and receiver/exciter operating at 7.2 GHz with a prototype multifrequency feedcone at DSS-13, and by the operation of two 400 KW transmitter subsystems at DSS-14 as planetary radar instruments. Among them, these three transmitters will demonstrate the capability for reliable superpower transmitters with 1000 second frequency stabilities of 5 parts in 10 to the 15th power and fully automated operation X-band uplink provides an alternative for the congested S-band uplink frequency band and provides more reliable command and telemetry performance while in two-way lock near solar conjunction. The wider bandwidth ranging possible with X-band uplink promises more precise navigation of spacecraft and improved radio science. The high phase stability also enhances navigation and increases the probability of gravity wave detection. Full automation of the 20 KW transmitter will enable substantial reductions in network operational costs through reduced operator intervention. Moreover, this effort will demonstrate the technology required for automation of the superpower transmitters, thereby providing increased productivity and availability Specific FY-83 objectives includes (1) completion of the receiver/exciter with automation (2) evaluation of the complete X-band system at DSS-13 for phase stability and other key telecommunications parameters, (3) continued evaluation of the new microwave feedcone assembly, (4) preliminary research into the feasibility of simultaneous dual-frequency two-way uplinks, and (5) continued support for superpower planetary radar by maintenance and operation of the DSS-14 R and D transmitters. Long term objectives include the development of a reliable

dual-frequency (nomially S-and X-bands) capability, development of highly reliable automated superpower transmitters, research into superpower waveguide techniques at X-band and higher frequencies, and research into 32 GHz transmitter technology

W83-70565

310-20-65

Jet Propulsion Laboratory, Pasadena, Calif ANTENNA SYSTEMS DEVELOPMENT

D A Bathker 213-354-3436

The objective of this RTOP is to identify, develop, and utilize selected applicable technology related to large earth station antennas for deep space communications, radio and radar science for the 1985 to 1995 time frame. The technology development effort aims at enabling the optimum use of existing facilities through affordable modifications and the construction of new facilities with maximized performance and minimized capital outlay and life cycle cost. The approach includes (1) software intensive analytic scattering studies for RF performance prediction (2) trial reflector designs, carried through to concept development and demonstration, (3) field demonstration of advanced multiband feeds. (4) software intensive analytical multiple constraint structural optimization for efficient designs of large, precise, electromechanical antenna structures and servo mechanisms, and (5) investigation of techniques and processes to enable affordable fabrication and use of precise reflector surfaces. Current work will complete the performance determination of a modeled clear aperture reflector and begin study of beam-waveguide-feed subreflectors to accomplish shaped-reflector performance in affordable ways. Work on 64m antenna upgrades has the goal of a 19 dB X-band gain increase. Modifications to be studied include (1) shaped reflector surfaces with optimum design for the complex tricone feed arrangement (2) Y-axis subreflector focusing, (3) reflector panels with improved surface precision. (4) additional structure bracing, and (5) extension of main reflector diameter to 70m Additional work concentrates on precision radio-astronomical measurements at X-band and K-band to better characterize the 64m antenna performance and on the development of microwave feed systems with increased versatility

W83-70566

310-20-66

Jet Propulsion Laboratory, Pasadena, Calif. RADIO SYSTEMS DEVELOPMENT Dean L Johnson 213-354-4942 (310-20-66)

The objective of this RTOP is to improve the earth-based receiving elements of the spacecraft-to-earth communications link in order to meet the future navigation, telemetry, and science needs of the space exploration program. This will require greater receiving capabilities such as wide instantaneous bandwidths, broad frequency tuning range coverage, total system frequency stabilities better than 1 part in 10 to the 15th power, and high reliability to reduce maintenance and operation costs and permit unattended operations. The RTOP objective will be met by (1) the development of a multifrequency, ultra-low noise amplifier system to cover S, X, and Ka-bands with 500 MHz instantaneous bandwidths, this multifrequency amplifier system will consist of S- and X-band parametric upconverters and a Ka-band maser in a single 3 Watt closed cycle refrigerator (CCR), (2) the establishment of a parametric upconverter development capability to assure the availability of ultra-low noise, wide bandwidth, cryogenically cooled parametric upconverters at any frequency between 1 and 30 GHz, with emphasis on existing bands at 23 and 84 GHz, (3) the development of cyrogenic filters to provide low noise amplifier protection from in-band and out-of-band radio frequency interference, (4) the development of technology to improve the reliability and increase the efficiency of the cryogenic cooling equipment (the goal will be to achieve an MTBF of one year for the reliability and an efficiency of five percent of Carnot efficiency, more than a factor of two improvement over the present DSN 1 watt CCR). (5) development of a receiver system design with the versatility, stability, and unattended operation compatibility needed for the future DSn at a minimum life cycle cost and (6) calibration and modeling of the propagation medium and the establishment of a data base of the statistics of meteorological effects at X- and Ka-band

W83-70567

310-20-67

Jet Propulsion Laboratory, Pasadena, Calif. COMMUNICATIONS SYSTEMS TECHNOLOGY DEVELOPMENT R Lesh 213-354-2766

The objective of this RTOP is to develop communication systems technology required to meet the needs of the Deep Space Network (DSN) supported missions for the late 1980's and 1990's During this time frame communications links which make more efficient use of power and which have substantially reduced size, weight and cost will be required for planetary exploration. Additionally, the easy access to space afforded by the space shuttle will result in increased Earth orbit activities. These in turn will produce the need for spaceborne relay of signals and eventually spaceborne operational control. To meet the foreseen needs for NASA space communications the RTOP has been structured along two major thrusts. The first focuses on improving or expanding the capabilities of current microwave communication techniques and includes work units for extending by at least 15 dB the threshold of the current DSN telemetry system, for developing coding and modulation techniques which are consistent with the present day constraints on complexity and which have the potential of an additional 2.0 dB reduction in required signal to noise ratio, and for realizing complex channel decoding structures in VLSI technology The second major thrust involves the use of optical frequencies for communication and contains work units for the conceptual design and demonstration of optical communications techniques (including the demonstration of 2.5 bit/detected photon data transfer during the beginning of FY-83), for the design and comparison of optical communications systems, and for the evaluation of the impacts of optical communications technology on spacecraft mission types which the DSN supports

W83-70568

310-20-68

Jet Propulsion Laboratory, Pasadena, Calif STATION MONITOR AND CONTROL TECHNOLOGY Conrad Foster 213-354-5070 (310-20-64)

The objectives of this RTOP are the development and demonstration of technology for unattended tracking station operations, and the generation of a data base for assessment of the impact of unattended operations on network productivity and network life cycle costs. The approach used is the development of a test bed remote controlled unattended station at DSS 13. This test bed includes automated control of an unattended 26-M antenna, high power transmitter, receiver-exciter, and data processing subsystems (subcarrier demodulator) Control of the equipment is from JPL. This test bed has evolved over several years to include an increasingly comprehensive set of subsystems, and improved operator interfaces. Fully unattended receive capability was demonstrated for six months in FYs 78 and 79 to provide controlled life cycle cost data. Unattended operation of the high power transmitter was demonstrated for two months in FY-80 to 81 Emphasis in FY-83 will be (1) to implement operator interface improvement to reduce human errors (2) test monitor and control functions of microprocessorbased antenna controller, (3) add control and monitor of prototype noise adding radiometer, (4) install and test automated traveling wave maser amplifier and closed cycle refrigerator, (5) collect data on reliability of commercial computational modules used in automation effort, (6) demonstrate concept of Spacecraft Surveillance System using DSS-13 antenna and RFI trailer Additionally, automation of preventive maintenance diagnostics of critical elements such as traveling wave masers is underway as is the improvement of automatic receiver acquisition at or near threshold

W83-70569

Jet Propulsion Laboratory, Pasadena, Calif
NETWORK MONITOR AND CONTROL TECHNOLOGY
K I Moyd 213-354-4608

The Network Operations Control Center (NOCC) provides the centralized real-time control of the Deep Space Network (DSN) and monitors and validates DSN performance. The present implementation of the NOCC real-time system is labor intensive in its operations difficult to modify, runs at or near full capacity of its resources and is without the flexibility for further growth. The existing NOCC real-time system was designed and developed around methodologies and hardware which were available and proven in the early 1970's. The broad objective of this RTOP is to develop and demonstrate a new functional architecture for the network real-time monitor system which will make use of the technological and methodological advances which have taken place since the inception of the existing NOCC system. Specifically, a replacement architecture will be developed which will include (1) consideration of expected system functional requirements for the 1990's, (2) allowances for projected growth in commercially available hardware. (3) consideration of hardware-software tradeoffs, (4) modularity in design to accommodate future expansion or modification, and (5) operational efficiency with the goal of minimizing human intervention. The architectural design will lead to selected demonstrations of key concepts during FY-83 through 85 This development will focus on a functional architecture, rather than a hardware architecture, and will use high-level standardized technology, thus allowing the replacement NOCC to take advantage of subsequent hardware improvements without requiring redesign or significant changes to software and remaining hardware

W83-70570

310-30-70

Jet Propulsion Laboratory, Pasadena, Calif HIGH-SPEED SIGNAL PROCESSING RESEARCH George S Downs 213-354-2765

The purpose of this RTOP is to investigate, develop test, and demonstrate advanced signal processing techniques and equipment which enable the Deep Space Network (DSN) to plan and achieve its performance requirements at reduced risk and cost to implementation and operations. The engineering objectives are (1) to design, develop, build, and operate a high-speed signal processing test-bed at Goldstone incorporating large scale integrated (LSI) circuits where possible (2) utilize this test-bed for real-time acquisition and processing for several classes of users (rapid automated reconfiguration of the test-bed elements will permit one processor system to serve all user classes), including high-rate telemetry validation antenna arraying for distant spacecraft, weak signal decoding, radio frequency interference (RFI) characterization and avoidance, and planetary radar (radar observations of Venus are to be used for the initial processing demonstration, where a 2 MHz sampling rate in 6 parallel channels is reduced to a data flow of 150 kBytes/sec onto magnetic tape) and (3) characterize the RFI environment at Goldstone, providing data to the NCP effort. During FY-83 the tasks are complete construction of the A/D converters and the correlators and integrate with the newly acquired VAX 11/780 computer, certify the operation of the test-bed, and move to Goldstone for evaluation and use design and start constructing additional signal processing blocks (FFT, array processor) pursue the design and fabrication of LSI circuits in high-speed Ga-As via a 1 GHz correlator circuit, and begin work on a Ga-AS A/D converter, complete the S-Band RFI report, add detection algorithm hardware to the RFI system, and obtain processed echoes from planetary surfaces with the high power radar system

W83-70571

310-40-26

310-40-37

Goddard Space Flight Center Greenbelt, Md

OPERATIONS SUPPORT COMPUTING TECHNOLOGY

D T Ketterer 301-344-8460

(310-10-49, 310-10-23 310-40-37 310-10-26)

This is a subsystem level RTOP which is aimed at improving the accuracy timeliness, cost effectiveness, and management of operational ground-based orbit computations in the Tracking and Data Relay Satellite System era. It addresses the evolution of operations support computing (OSC) technology into the later 1980's and beyond. This objective is accomplished through system studies to determine, develop, and analyze advanced operational concepts, a management information system, and computer system designs, and through concept test and evaluation via prototype implementation of specific capabilities in controlled environments System studies in FY-83 will concentrate on developing concepts and techniques for a computer based information system to improve OSC management functions. Other tasks will focus on the demonstration of human engineering and advanced operational concepts in the mission support computing environment. A Research and Technology Support Facility (RTSF) employing intelligent terminals will be implemented and dumb terminals will be enhanced to develop and demonstrate recommended concepts

W83-70572
Goddard Space Flight Center, Greenbelt Md
HUMAN-TO-MACHINE INTERFACE TECHNOLOGY
W F Truszkowski 301-344-9261

The objectives of this RTOP are to develop and apply natural man/machine interfaces for space payload and ground control systems, and develop a methodology and guidelines which emphasize the human factors issues associated with man/machine interfaces. The intention is to apply recent advances in human factors analysis, low-cost microprocessor hardware, and artificial intelligence software techniques augmented with audio and touchtone input/output technology to the man/ machine interface problems associated with such systems. The approach to be taken is first, to identify and apply state-of-the-art voice/touchtone technology to mission and data operations systems interfaces, second, to apply human factors and advanced knowledge representation techniques and methodologies in the development and application of user interfaces to various data/information bases actively used in the mission and data operations environment, and thirdly, to formulate a plan and investigate the feasibility of establishing a human factors lab environment to support near-term application-directed man/machine interface development and testing. This RTOP is a system-level RTOP supporting Tracking and Data Relay Satellite System operations, mission operations, and mission support computing

W83-70573 Goddard Space Flight Center, Greenbelt Md MISSION OPERATIONS TECHNOLOGY R G Sanford 301-344-6138 310-40-45

The mission operations technology RTOP is a subsystem level RTOP. the objective of which is to transfer state-of-the-art hardware, software and automation technology to the mission operations environment to improve operations efficiency and reliability and reduce costs. This RTOP is divided into two tasks control center automation and distributed control research. The control center automation task seeks to develop a highly automated operations control center capable of supporting multiple simultaneous missions by the study and specification of the levels of automation for systems resource allocations, connection, test, and status reporting. The distribution control research task will provide the technology required for a workable distributed mission control environment by the development and implementation of a distributed command management software systems

W83-70574

310-40-46

Goddard Space Flight Center, Greenbelt, Md IMAGE PROCESSING TECHNOLOGY Frederick W McCaleb 301-344-6386

This RTOP supports the development and utilization of image processing technology. Currently there are two major objectives of this RTOP (1) utilization of optical disk data storage technology in image processing systems, and (2) development of automatic quality control (QC) capability for image processing systems. These objectives are being pursued as two independent tasks. Task one pursues the development of the systems technology required to utilize optical disk recorder/ reproducers for image data storage in image processing systems. Task two assesses available QC techniques to determine if they can be automated and identifies processing functions which cannot be automatically quality controlled

W83-70575

310-40-49

Goddard Space Flight Center, Greenbelt Md SYSTEMS MANAGEMENT TECHNOLOGY

Paul J Ondrus 301-344-8001

The objective of this RTOP is to develop and validate concepts and techniques which can optimize the evolution and operation of space tracking and data systems (STDS) Its major objectives are (1) the automation of the requirements definition process, (2) the definition, design, and implementation of a cost allocation/prediction model for STDS subsystems, and (3) the formulation of a research program to explore the nature of control and decision making in large-scale decentralized systems. The RTOP approach is to develop associated tools and techniques, apply the techniques to representative STDS problems, and evaluate both the techniques and the results prior to its operational introduction in STDS. The analysis of these specific issues and the development of the specified system management techniques are needed in order to provide an information base and tools that can be used to improve the productivity and effectiveness of STDS systems during the 1980's This RTOP is a system level activity supporting spacecraft data acquisition, TDRSS operations, data processing, mission operations, and mission support computing

W83-70576

310-40-72

Jet Propulsion Laboratory, Pasadena, Calif NETWORK SOFTWARE DESIGN TECHNOLOGY

William M Whitney 213-354-4410

The focus of this RTOP is on software methodology and tools that will reduce cost and increase human productivity in the design and implementation of Deep Space Network (DSN) hardware and software Two broad objectives are being pursued. The first is to develop a coherent approach to software-system engineering for DSN systems, and to create a family of tools that will put this methodology to use and at the same time test its validity. One tool (SOFTCOST) makes it possible to forecast overall resource requirements in software implementation Another (CRISP) supports software design and analysis During FY-83. these tools will be augmented and improved, and installed on the Management and Development Network (MADNET) to demonstrate their feasibility. A new tool is being developed to promote structured design and good documentation with minimum effort on the part of people writing programs in support of DSN research and development. The second broad objective is to provide software facilities for computer aided design of large scale and very large scale integrated circuits (LSI/VLSI) A coherent, well-integrated set of computer tools will be developed to assist DSN engineers in the design and designverification of custom LSI/VLSI circuits. As a first step, tools developed elsewhere will be imported for use by DSN designers, eventually these will be improved, adapted to reflect DSN technologies and design practices, and brought together under an executive program A more powerful system of software facilities is also to be provided that will enable system engineers to design chips for certain classes of digital functions without having to elaborate and manage the details of circuit

layout at the geometrical level. What these classes should be will be ascertained in a study of future DSN applications and their requirements

OFFICE OF SPACE TRANSPORTATION **SYSTEMS**

Advanced Programs

W83-70577

906-50-00

Marshall Space Flight Center, Huntsville, Ala SPACE PLATFORM SPECIFICATION DEVELOPMENT

L E Powell 205-453-5310

The objective of this effort is to develop the system and subsystem specifications required for a free-flying space platform to support science and applications requirements as an element of a space station concept of a cluster of space platforms tended by a manned space station. The results of the space station mission analysis studies will be used in conjunction with the experience gained from the space platform payload accommodations analysis to determine the accommodations to be provided to the payloads of the free-flying platforms. A contractor participating in the space station mission analysis contract reviews will assimilate the science and applications data to determine the accommodations required by the science and applications users and convert this into a document of system and subsystem requirements/ specs These requirements will be utilized by the Phase B and Phase C/D Space Station contractors to determine the method of spinoff, evolution and etc of systems or subsystems from the Space Station for the elements of the free-flying platforms

W83-70578

906-54-00

Lyndon B Johnson Space Center, Houston, Tex

MANNED FACILITIES

R F Baillie 713-483-2703

The shuttle provides this country with a new level of capability in transportating payloads to low Earth orbit (LEO) both from cost and on-orbit operations standpoints, and it will effectively double the single-launch mass capability to geosynchronous orbit (GEO). The shuttle system also has the capability for servicing satellites in LEO and for assembling systems which have an operational configuration somewhat larger than the orbiter payload bay. Commercial and defense requirements have been established which necessitate extending large payload capability and manned operations out to GEO and beyond The most effective way to do this is by establishing an operations center in LEO which, in effect, is a staging area (or forward base) for ground-to-GEO transportation system, a station which supports the assembly, launch, recovery, and servicing of large unmanned payloads and manned modules for missions to GEO and back to LEO. This space station would also provide the additional capabilities of constructing complex space systems too large for a single shuttle launch and of providing periodic servicing for co-orbiting commercial, science, and applications satellites. The approach in FY-83 will be to continue in-house and funded generic system studies and proto-type hardware development and to initiate activities concerning SS operations and mission planning

W83-70579

906-54-20

Langley Research Center, Hampton, Va

SYSTEM ANALYSIS AND EVALUATION OF PERMANENTLY MANNED ORBITING SPACE FACILITIES

R Hook 804-827-3666

System analysis and evaluation of competing system design concepts and missions relative to achieving permanently manned orbiting facilities in space is to be performed. A stable and well-controlled approach to system analysis will be employed, which uses proven computer-aided design and analysis techniques and methodologies to perform technical and programmatical evaluation tasks to obtain system trade-off and design sensitivity data. System design synthesization, analytical modeling, and system analysis tasks will be performed, and an accessible multidisciplinary subsystem technical data base will be developed for the purpose of establishing design, cost, and mission model benchmark as needed for comparative evaluation between manned facility approaches which are evolving within both the U.S. National and European aerospace communities Parametric analyses will be performed to determine the relative merits of each concept and the technology needs which are conept peculiar and which are more basic

W83-70580

906-55-00

Marshall Space Flight Center, Huntsville, Ala STRUCTURAL ASSEMBLY DEMONSTRATION EXPERIMENT (SADE)

J K Harrison 205-453-2817

The SADE objectives are (1) to demonstrate that the shuttle is a suitable base for space construction. (2) to determine the extent to which neutral bouyancy simulator test results can predict flight test results, and (3) to validate and demonstrate the SADE truss design by measuring the performance of the deployment and assembly operation A single flight in 1985 is planned to construct a 50-foot long truss structure using both deployment and assembly techniques. The construction operation will require EVA and RMS activity. The entire construction procedure will be simulated in the MSFC neutral buoyancy simulator before the flight. Hardware already developed will be modified for use in these simulations. Flight hardware configurations will be based on the results from these simulations.

W83-70581

Marshall Space Flight Center, Huntsville, Ala MANNED FACILITIES (SPACE STATION)

W G Huber 205-453-0413

The objectives of this effort are to provide supporting studies and advanced development in support of the space station program. The approach is to perform contracted and in-house analyses of key space station issues, subsystems, and mission implementation scenarios focused on technical background to support Phase B and subsequent development as well as provide for the test and demonstration of critical space station subsystems and new technologies necessary for a commitment to flight hardware development in 1985-1986. The FY-83 effort will include continuation of the space station mission implementation studies, analyses of key space station system issues, and continued testing of critical subsystems with breadboard hardware.

W83-70582 906-63-00

Marshall Space Flight Center, Huntsville, Ala **HIGH ENERGY UPPER STAGE**R E Austin 205-453-2796 (506-63-29)

The objective of this effort is the preliminary definition of the high energy upper stage (HEUS) system and development of planning and cost data to support subsequent hardware design and fabrication contract as well as the conducting of critical subsystems supporting development activities. In-house and contract studies have developed requirements and candidate concepts for a HEUS system. The management of the definition studies and participation in all aspects of these studies through participation in study reviews, review of contractor documentation, correlation of related advanced development activities and interfacing elements (DOD, STS, TDRSS, launch facilities, etc.) activities will be used as the basis for the Phase C/D effort. It will also provide the cost and schedule data required.

W83-70583 906-63-00

Lyndon B Johnson Space Center, Houston, Tex ADVANCED TRANSPORTATION

R F Baillie 713-483-2703

Proposed space missions for the 1980's will require the addition of STS orbit-to-orbit transportation stages which augment the current capability of the IUS and provide for the presence of man's unique capability in geosynchronous orbit. The objectives of this RTOP are to investigate techniques for operating advanced orbital transfer vehicle (OTV) from a space station and to determine feasibility of utilizing aero-assisted bracking techniques. Funded RTOP's will investigate GN&C requirements and propellant transfer requirements. In-house activities will be initiated on aerodynamic-assisted OTV's Specific Tasks for FY-83 include. OTV GN&C requirements analysis, cryogenic propellant requirements analysis, and flight demonstration of gas dynamic technologies for aerodynamic/assisted OTV's.

W83-70584 906-64-20

John F Kennedy Space Center, Cocoa Beach, Fla SPACE OPERATIONS STUDY, FOLLOW ON

F C Bryan 305-867-4010

The first phase of the KSC Space Operations Study was initiated in 1982 to analyze space station-oriented operations and activities from a ground operations perspective. This study applied ground operations expertise in assessing various space operations to define operational requirements, develop approaches and scenarios, and identify possible innovations and candidate items for further technology development. The second phase of this study will further explore selected space operations to refine the operational requirements evaluate alternative approaches and substantiate the needs for identified technology developments. Detailed analyses of significant space methods, resources, issues and concerns will be conducted to ensure effective and timely support to the space station development process. The study will also pursue in depth the proper operational tradeoffs between space station operations and ground operations in order to minimize new requirements.

placed upon deployable spacecraft that are processed through the space station

W83-70585 906-64-21

John F Kennedy Space Center, Cocoa Beach, Fla

ADVANCED SPACE TRANSPORTATION SYSTEMS GROUND OPERATIONS

H J DeLaRosa 305-867-2163

906-58-00

In support of work being done by MSFC on the shuttle derived class of vehicles, a one year study was initiated by KSC to look at the launch site requirements to process these kinds of vehicles. The study defined in concept terms any new facilities, modifications to existing facilities, impacts to on-going STS activities, ground support equipment, ground operation activities as well as estimated manpower and cost associated with the processing and launch of each of the vehicles covered by this study. The level of detail of the defined requirements was sufficient to determine the basic impact to the launch site facilities schedules, and manpower with corresponding cost estimates but was not to a level sufficient to implement the program at the launch site. This study effort will build on the data previously developed to a level consistent with the MSFC study activity eliminating configurations no longer being considered by MSFC and adding or highlighting configurations consistant with the MSFC studies.

W83-70586 906-64-22

John F Kennedy Space Center, Cocoa Beach, Fla SPACE STATION GROUND OPERATIONS STUDY, FOLLOW ON STUDY

F C Bryan 305-867-4010

The JSC Space Operations Center and the MSFC manned platform will be of modular construction, consisting of habitation, service, and logistics modules. The initial study assessed the operational planning for processing the space station elements through the KSC and assessed ground operations vs space operations from a payload point of view. This follow on study will provide further definition of the ground operations approaches, processing plans, and resource requirements. Interface verification will be addressed in further detail.

W83-70587 906-64-23

John F Kennedy Space Center, Cocoa Beach, Fla GROUND OPERATIONS ASSOCIATED WITH SPECIAL FLIGHT DEMONSTRATIONS

D Moja 305-867-3644

Special flight demonstration payloads and various types of satellite servicing equipment are being considered for space shuttle missions in the mid-1980's. The proposed flight demonstration payloads include space construction experiments and cryogenic propellant transfer attorage experiments. Satellite servicing equipment includes maneuverable television, proximity operations module, and teleoperator maneuvering system. These flight experiments and items of special equipment will require unique planning at KSC in the areas of checkout, servicing, storage, and possibly refurbishing and reprocessing. The purpose of this study is to identify special flight equipment and satellite servicing equipment, determine launch site requirements, and to recommend facilities. GSE, and operational scenarios to onset these requirements.

W83-70588 906-64-24

John F Kennedy Space Center, Cocoa Beach, Fla

ORBITAL TRANSFER VEHICLE GROUND OPERATIONS STUDY

D Moja 305-867-3644

High energy upper stages (HEUS) hereafter called orbital transfer vehicles (OTV) concepts are being studied by NASA and the DOD. The OTV is being considered to expand the STS capability in the late 1980's and 1990's OTV concepts will include expendable and reusable vehicles with round trip capability where the OTV may return empty or return with a payload to the shuttle or a space station. This study will address the need for new or modified KSC facilities and GSE to handle, test, assemble and service the OTV. The study will aslo address any unique requirements resulting from a reusable OTV.

W83-70589 906-65-00

Marshall Space Flight Center, Huntsville, Ala
ADVANCED TRANSPORTATION SHUTTLE DERIVED VEHICLES
(SDV)

M A Page 205-453-3425

The objectives of this effort are (1) to refine vehicle concepts and supporting facilities/equipment definition for shuttle derived vehicles. (2) to establish and incorporate mission requirements into the basic vehicles definition, and (3) to determine costs, behefits, and schedules required for implementation Contracted studies are currently in progress to define several shuttle derived vehicle concepts that could augment the basic STS in several different ways. These concepts utilized current

state-of-the-art technologies and the configurations were established by trade analysis SDV concepts that are currently being investigated include SRB-X, aft-cargo carrier (ACC), shuttle derived cargo vehicles and reusable liquid rocket boosters for use with the basic STS and/or shuttle derived cargo vehicles. Potential mission applications and benefits will be examined in more depth for selected vehicle concepts or classes in FY-83, along with further definition of the vehicle concept(s), its capabilities and requirements for implementation. Trade studies to determine the benefits of flyback boosters, in comparison with ballistic down-range recovery approach will be made. Cost and schedule estimates will be made in preparation for configuration trades and selection.

W83-70590

906-70-00

Marshall Space Flight Center, Huntsville, Ala

TETHERED SATELLITE SYSTEM (TSS) (SYSTEM DEVELOPMENT)
J H Laue 205-453-4570

The objective of this task is to accomplish the first of a two-phase development activity leading to the design/development of a deployer system and overall system integration of the TSS. The FY-83 activity will involve continuation of advanced development phase tasks including (1) systems requirements analysis (2) system/subsystem design update (3) design trade studies. (4) breadboards, and (5) phase C/D planning Phase A in-house and Phase B contracted definition studies resulted in concepts for a TSS to be used as a Shuttle-borne facility for conducting scientific experiments and applications beginning in 1989. The FY-83 activity will be performed by one of the two Phase B contractors Contractor selection will be by a competitive process and will be based on the Phase B contractor's response to a Request for Proposal (RFP) for a two phase development of the TSS. This RTOP addresses the FY-83 initial, or advanced development, phase of the development. The second phase, the design and development phase, is planned to begin in FY-84 and will lead to initial launch of the experimental flight TSS in early 1987. The experimental flight TSS will include engineering instrumentation and a demonstration science experiment

W83-70591

906-75-00

Marshall Space Flight Center, Huntsville, Ala TELEOPERATOR MANEUVERING SYSTEM

J R Turner 205-453-2769

The objective of this effort is to provide the preliminary definition (Phase B) of the teleoperator maneuvering system (TMS) and development of planning and cost data to support the subsequent hardware design and fabrication contract. In addition, this effort will include supporting development activities in the rendezvous, docking. TMS remote control and servicing system/manipulator areas. Extensive in-house and contracted studies have built a sound base of potential applications for this system and have defined competing concepts of satisfying the requirements. Through the day-to-day management of this follow-on definition phase, all segments of potential user interest/requirements will be factored into a set of firm requirements supported by cost and schedule data for the initiation of the follow-on hardware phase. It is expected that a minimum of two contract activities will be funded and supported by in-house system trades and supporting development activities.

W83-70592

906-75-00

Lyndon B Johnson Space Center, Houston, Tex ORBITAL SERVICES

Richard F Baillie 713-483-2703

The shuttle mission model identifies many payload deployment and retrieval requirements beyond the capability of the basic shuttle system Satellites such as the MMS and space telescope require periodic servicing Studies of some future space systems show that longer operational lifetimes are necessary for long-duration, low-cost operation, and that a servicing capability including maintenance, repair, and refurbishment will be required Studies of possible flux densities of non-functional satellites and debris in the year 2000 time period show results indicating potential hazards to space flight It is now timely for the development of a satellite services capability for a cost-effective means of meeting early payload needs and to meet longer-term requirements for dealing with maintenance and satellite removal requirements. This RTOP includes the definition, design, development, fabrication, and testing for engineering and operational verification of key elements of a satellite services system These services include deployment and retrieval of payloads, servicing of payloads, and development of techniques for handling large flexible structures

W83-70593

906-80-00

Lyndon B Johnson Space Center, Houston, Tex ADVANCED CONCEPTS

Richard F Baillie 713-483-2703

Activities covered by this RTOP investigate new and promising

concepts for accomplishment of function relevant to OSTS needs FY-82 activities will concentrate on understanding unique vehicle control techniques which utilize spaceborne tethers. Specific Tasks for FY-83 include investigations of dynamic stability and the power/drag generator

W83-70594

906-90-00

906-90-03

Marshall Space Flight Center, Huntsville, Ala DEPLOYABLE ANTENNA FLIGHT EXPERIMENT

Wilbur E Thompson 205-453-2796

The FY-83 objectives are to continue system integration studies of Shuttle-attached large structure/antenna flight tests to support STS capability development and planning on future space test operations This effort will augment existing preliminary designs and plans which were produced by system definition studies of a large-aperture engineering flight test and measurement program on the Orbiter Studies to date have focused on a reusable test-bed structure to provide engineering and operations data which addresses both STS requirements and user application requirements for space operations with 50-200 meter deployable systems. Phase A contracted studies during FY-77 to FY-79 produced design concepts and flight test program options which allowed initiation of joint NASA/DOD studies in FY-80 to further define a flight experiment with multi-user test objectives Parallel system definition of the antenna flight test was continued in FY-81 along with initiation of hardware development for structural ground tests on the large deployable support mast FY-82/-83 studies will complete the system integration definition to support STS program planning for candidate flight test programs Also planned for FY-83 are design, fabrication and testing of ground-based components to aid design and manufacture of closetolerance space test articles. These accomplishments in FY-83 will retain a NASA, or Joint-Agency, option to implement design and development in FY-84/-85

W83-70595

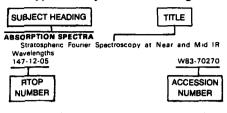
Marshall Space Flight Center, Huntsville, Ala GEOSTATIONARY PLATFORM BUS DEFINITION

T Carey 205-453-3424 The objectives of this RTOP are to complete all pre-phase B studies for the initial (or first) geostationary platform bus and establish working relationships with government agencies and industry for a potential joint endeavor. Maximum use will be made of the currently defined experimental geostationary platform bus Reference missions (e.g., INTELSAT 7, Voice of America, Direct Broadcast) will be used to define various candidate configurations Preliminary designs will be developed based on user provided candidate payloads and carried to the point where the feasibility of each candidate bus configuration can be assessed. Supporting programmatic data necessary to initiate Phase B will be developed Multi-purpose bus(es) that can accommodate all of the reference missions with only minor changes from one to the next will be defined Payloads which best serve to demonstrate technologies viewed as high risk by potential future commercial geostationary platform users will be given primary consideration. Care shall be taken to preserve the integrity of the currently defined experimental geostationary platform which already contains technologies and systems in need of demonstration. Close coordination will be developed and maintained with representatives from government agencies and industry with a view toward developing a joint endeavor for the hardware phase of the project

SUBJECT INDEX

RTOP SUMMARY FISCAL YEAR 1983

Typical Subject Index Listing



A title is used to provide a more exact description of the subject matter. The RTOP accession number is used to locate the bibliographic citations and technical summanes in the Summary Section.

A	
ABIOGENESIS Chemical Evolution	
199-50-12	W83-70434
Solar System Environments	
199-50-42 ABSORPTION CROSS SECTIONS	W83-70437
Solar Flux in Upper Atmosphere	
147-15-00	W83-70273
Photochemistry of the Upper Atmosphere 147-22-01	W83-70279
Upper Atmosphere Research - Laboratory N	leasurements
147-23-00	W83-70280
ABSORPTION SPECTRA Stratospheric Fourier Spectroscopy at Near	and Mid IR
Wavelengths	
147-12-05	W83-70270
Quantitative Infrared Spectroscopy of Minor Co the Earth's Stratosphere	onstituents of
147-20-03	W83-70276
Upper Atmosphere Research - Laboratory N	fleasurements
147-23-00 Laser Laboratory Spectroscopy	W83-70280
147-23-09	W83-70282
Planetary Astronomy and Supporting Laborat	tory Research W83-70397
196-41-67 ABSORPTION SPECTROSCOPY	W83-70397
Stratospheric Research Balloon Laser In-Situ	Sensor
147-11-04 ABSORPTIVITY	W83-70267
	Profile and
Column-Content	
673-11-00	W83-70498
ABUNDANCE Studies of the Distribution of Elements and M	ineral Phases
Among Meteorites	
152-03-60	W83-70295
Advanced Infrared Astronomy and Laboratory 196-41-54	W83-70396
ACCELERATION STRESSES (PHYSIOLOGY)	
Space Motion Sickness 199-20-21	W83-70414
Biological Adaptation	1103-70414
199-40-32	W83-70433
ACCELEROMETERS High Resolution Accelerometer Package (HiRA)	P) Experiment
Development	
506-63-43	W83-70228
ACCIDENT PREVENTION Operational Problems Fireworthiness and Cra	shworthiness
505-45-11	W83-70088
ACOUSTIC LEVITATION Development of a Shuttle Flight Experiment Di	ron Dunamice
Module	up Dynamics
542-03-01	W83-70241
Multimode Acoustic Research 179-15-20	W83-70355
Advanced Containerless Processing Technology	/
179-20-55	W83-70356
Spherical Shell Technology Study 179-20-57	W83-70358
ACOUSTIC MEASUREMENT	***************************************
Life Prediction for Structural Materials	
505-33-23 ACOUSTICS	W83-70022
Mathematics for Engineering and Science	
505-31-83	W83-70016
Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Verifi	cationOEX
Program)	
506-63-39	W83-70225
ACOUSTO-OPTICS Acousto-Optic & Submillimeter Device Techno	logy
506-54-16	W83-70151
Planetary Instrument Development Progra	am/Planetary
Astronomy 157-05-50	W83-70328
ACTIVE CONTROL	
Loads and Aeroelasticity 505-33-43	W83-70028
000-00-40	***************************************

Aircraft Controls Theory and Applications 505-34-03	W83-70032
High Performance Aircraft Flight Dynamic	
Qualities 505-43-11	W83-70070
Advanced Fighter Technology Integ	gration/F-111
(AFTI-F-111) 533-02-11	W83-70101
ACTUATORS	
Flight Control Concepts and Reliability Enhanc 505-34-01	ement W83-70030
Controls and Instrumentation	
505-40-52 Automation Systems Research	W83-70060
506-54-63	W83-70161
ADAPTATION Biological Adaptation	
199-40-32	W83-70433
ADAPTIVE CONTROL Advanced Fighter Technology Integ	ration/F-111
(AFTI-F-111)	
533-02 11 Automation Systems Research	W 8 3-70101
506-54-63	W83-70161
Spacecraft Controls and Guidance 506-57-13	W83-70185
Advanced Control Technology	
506-57-15 ADHESION	W83-70186
Non-Destructive Evaluation and Tribology	
506-53-12 ADSORBENTS	W83-70128
Surface Physics and Computational Chemistry	
506-53-11 AERIAL PHOTOGRAPHY	W83-70127
Remote Sensing Techniques for Geobotanical (Discrimination
of Chromium-Bearing Rock Types 677-42-05	W83-70537
Topographic Mapping Methods	
677-43-17 AERIAL RECONNAISSANCE	W83-70540
Ocean Optics	
161-30-00 Land Cover Multisensor Analysis	W83-70339
677-21-25	W83-70514
Chromite Test Case Study 677-41-17	W83-70533
AEROACOUSTICS	
Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-70009
Aeroacoustics Research	
505-31-33 Graduate Program in Aeronautics	W83-70010
505-36-22	W83-70046
Propeller Research 505-40-32	W83-70058
Low Speed Wind Tunnel Operations 505-42-81	W92 70067
Advanced Turboprop Program	W83-70067
535-03-12 AERODYNAMIC CHARACTERISTICS	W83-70122
Computational Methods and Application	s in Fluid
Dynamics 505-31-01	W83-70001
Computational and Analytical Fluid Dynamics	
505-31-03 Experimental/Theoretical Aerodynamics	W83-70003
505-31-21	W83-70007
Experimental/Applied Aerodynamics 505-31-23	W83-70008
Propeller Research	
505-40-32 Rotorcraft Airframe Systems	W83-70058
505-42-23	W83-70065
Geodynamics/Flight Dynamics of Powered 505-43-01	Lift Vehicles W83-70068
High Performance Aircraft Flight Dynamics & (Controls
505-43-13 High-Speed Aerodynamics and Propulsion Inte	W83-70071 gration
505-43-23	W83-70073
Interagency & Industrial Assistance & Testing 505-43-32	W83-70075
Interagency and Industrial Assistance and Test 505-43-33	ing
Supersonic Propulsion Integration Technology	W83-70076
505-43-42	W83-70077
Supersonic Aerodynamics Configurations Structures & Materials Technology	Integration
505-43-43	W83-70078
Hypersonic Aeronautics Technology 505-43-81	W83-70080
High Speed (Super/Hypersonic) Technology 505-43-83	W83-70082
Propulsive-Lift Technology - QSRA Flight Expe	riments
533-02-50	W83-70106

Powered Lift Systems Technology - Harrier Fli Program	ght Research
533-02-51	W83 70107
Forward Swept Wing Support 533-02-83	W83 70112
Advanced Turboprop Program 535-03-12	W83 70122
Entry Vehicle Aerothermodynamics 506-51-13	W83-70124
Shuttle Entry Air Data System (SEADS)	
506-63-32 Shuttle Upper Atmosphere Mass Spectrom	W83 70220 neter (SUMS
506-63-37 High Resolution Accelerometer Package (HiRAI	W83 70224 P) Experimen
Development 506-63-43	W83 70228
AERODYNAMIC CONFIGURATIONS Computational Methods and Applications	
Dynamics,	
505-31-01 Conceptual Characterization and Technology	
506-63-29 AERODYNAMIC DRAG	W83-70218
Viscous Drag Reduction and Control 505-31-13	W83 7000!
Boundary-Layer Stability and Transition Reseal 505-31-15	
Rotorcraft Aeromechanics and Configurations	
505-42-11 AERODYNAMIC FORCES	W83-70064
Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83 70009
AERODYNAMIC HEATING Detailed Aerothermal Loads	
506-51-23 Thermo-Gasdynamic Test Complex	W83-7012
506-51-41	W83-70126
Structures Analysis and Synthesis 506-53-51	W83 7014
AERODYNAMIC LOADS Flight Loads Analysis	
505-33-41 Loads and Aeroelasticity	W83-7002
505-33-43 Forward Swept Wing Support	W83-70028
533-02-83 Detailed Aerothermal Loads	W83 70112
506-51-23	W83-7012
AERODYNAMIC NOISE Aeroacoustics Research	
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING	W83-70010
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics	
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Qualities 505-43-11	and Flying
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics & 0 505-43-13	w83-70070 Controls W83-70071
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics & 6 505-43-3 Interagency and Industrial Assistance and Test 505-43-33	w83-70070 Controls W83-70071
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics & (505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83	w83-70076 Controls W83 70071
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics & 0 505-43-13 Interagency and Industrial Assistance and Test 505-43-35 Forward Swept Wing Support	w83-70076 W83-70076 Controls W83-70076 W83-70076 W83-70112
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics & 6 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics	w83-70076 W83-70076 Controls W83-70076 Ing W83-70076
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program	w83-70070 Controls W83-70071 ing W83-70076 W83-70112 s in Fluic
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support	w83-70076 W83 70076 Controls W83 70076 ing W83-70076 w83-70112 s in Fluid W83-70001
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support 505-36-38 Numerical Aerodynamic Computational Technic	w83-70070 Controls w83 70071 ing w83-70112 s in Fluid w83-70001 w83-70048
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts	s and Flying W83-7007(Controls W83-7007(W83-7007(W83-7007(W83-70016(W83-70001(W83-70046(W83-7004(W83-7
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21	w83-70070 Controls w83 70071 ing w83-70112 s in Fluid w83-70001 w83-70048
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFS Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81	s and Flying W83-70070 Dontrols W83-70076 W83-70076 W83-70012 s in Fluic W83-70004 W83-7004 W83-7004 W83-7004 W83-7004 W83-7004 W83-7004
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Cualities	s and Flying W83-7007(Dontrols W83-7007(W83-7007(W83-70012(W83-7004(W83
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-93 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-3-11	s and Flying W83-70070 Dontrols W83-70076 W83-70076 W83-70012 s in Fluic W83-70004 W83-7004 W83-7004 W83-7004 W83-7004 W83-7004 W83-7004
Aeroacoustics Research 505-31-33 AEROPYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-33 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFS Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-42-81 Ling Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-43-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32	s and Flying W83-7007(Dontrols W83-7007(W83-7007(W83-70012(W83-7004(W83
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-33 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFS Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-43-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Flight Loads Analysis 505-33-41	s and Flying W83-70070 Dontrols W83-70076 W83-70076 W83-70010 W83-70045
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 0ualities 505-43-11 High Performance Aircraft Flight Dynamics & 6 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFS Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-31-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-33-41 Engine Dynamics and Aeroelasticity 505-33-41	s and Flying W83-70070 Dontrols W83-70070 W83-70070 W83-70012 s in Fluid W83-70045 W83-7005
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-93 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-38-21 JIAFs Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-43-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-33-41 Engine Dynamics and Aeroelasticity	w83-70026 w83-70070 w83-70070 w83-70070 w83-70012 w83-70046 w83-70046 w83-70062 w83-70070 w83-70070 w83-70070 w83-70026
Aeroacoustics Research 505-31-33 AEROPYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-33 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-43-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Flight Loads Analysis 505-33-41 Engine Dynamics and Aeroelasticity 505-33-42 Loads and Aeroelasticity 505-33-43 Graduate Program in Aeronautics	w83-70025 w83-70026 w83-70026 w83-70026 w83-70046
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 00alities 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFS Base Support 505-36-23 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-43-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Flight Loads Analysis 505-33-41 Engine Dynamics and Aeroelasticity 505-33-42 Loads and Aeroelasticity 505-33-43 Graduate Program in Aeronautics 505-36-22 Rotorcraft Airframe Systems	s and Flying W83-70070 Dontrols W83-70070 W83-70070 W83-70010 W83-70045 W83-70045 W83-70045 W83-70045 W83-70005
Aeroacoustics Research 505-31-33 AERODYNAMIC STALLING High Performance Aircraft Flight Dynamics 0ualities 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-83 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFS Base Support 505-36-21 JIAFS Base Support 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-33-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Flight Loads Analysis 505-33-41 Engine Dynamics and Aeroelasticity 505-33-43 Graduate Program in Aeronautics 505-38-22 Rotorcraft Airframe Systems 505-42-23 Interagency and Industrial Assistance and Test	s and Flying W83-70070 Dontrols W83-70070 W83-70070 W83-70010 W83-70045 W83-70045 W83-70045 W83-70009
Aeroacoustics Research 505-31-33 AEROPYNAMIC STALLING High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency and Industrial Assistance and Test 505-43-33 Forward Swept Wing Support 533-02-93 AERODYNAMICS Computational Methods and Application Dynamics 505-31-01 Aeronautics Graduate Research Program 505-36-21 JIAFs Base Support 505-36-43 Numerical Aerodynamic Computational Technic 505-37-01 Advanced Computational Concepts 505-37-01 Advanced Computational Concepts 505-37-21 Low Speed Wind Tunnel Operations 505-42-81 High Performance Aircraft Flight Dynamic Qualities 505-43-11 AEROELASTICITY Fluid Mechanics of Turbomachinery/Lewis 505-33-41 Engine Dynamics and Aeroelasticity 505-33-42 Loads and Aeroelasticity 505-33-43 Graduate Program in Aeronautics 505-36-22 Rotorcraft Airfarame Systems 505-42-23	w83-70026

AEROMANEUVERING ORBIT TO ORBIT SHUTTLE

Rotorcraft Systems Integration		Radiation Effects and Protection		AIR TRANSPORTATION	
AEROMANEUVERING ORBIT TO ORBIT SHUTT		199-20-76 Human Behavior and Performance	W83-70426	Crew Cockpit Interface Technology 505-35-23	W83-70039
	Assessment W83-70218	199 20-82 General biomedical Research	W83-70427	AIR WATER INTERACTIONS Time Dependent Fields	
AERONAUTICAL ENGINEERING Research in Advanced Material Concepts for	Aeronautics	199 20-92	W83-70428	161-20-11 Ocean Processes Branch Scientific Program :	W83-70338 Support
	W83-70017	Cosmos Flight Experiments Project 199 70-12	W83-70448	161-50-02 Climate Observations	W83-70345
	W83-70042	Sample Bank 199 70-32	W83-70449	672-40-00	W83-70494
505-36-12	W83-70043	Advanced Equipment Development	W83-70450	AIRBORNE EQUIPMENT Clear Air Turbulence Studies Using Pass	ive Microwave
	W83-70044	199 80-31 Vestibular Research Facility (VRF)/Variable (Radiometers 505-45-05	W83-70086
Aeronautics Graduate Research Program 505-36-21	W83-70045	Facility (VGRF) 199 80-32	W83-70451	Infrared Imagery of Shuttle 506-63-35	W83-70222
Graduate Program in Aeronautics 505-36-22	W83-70046	Long Duration Life Sciences Satellite Pro 199 80-42	ogram Definition W83-70452	FILE Flight ExperimentsAnalysis and Suppo 542-03-14	rt W83-70243
Graduate Program in Aeronautics	W83-70047	Large Primate Facility		Meteorological Lidar Development 146-74-01	W83-70263
JIAFs Base Support	W83-70048	199-80-52 Interdisciplinary Research	W83-70454	Atmospheric Processes Experiments and Sys 147-10-03	
Radio Technical Commission for Aeronautics (R	TCA)	199 90-71 Ames Research Center Initiatives	W83-70456	Aircraft Borne LIDAR for O3 and OH Measur	rements
AERONOMY	W83-70117	199-90-72	W83-70457	673-14-00 Multisensor Technique Development	W83-70500
Planetary Aeronomy Theory and Analysis 154-60-80 v	W83-70314	AEROSPACE SAFETY Biological Effects of Particle Radiation		677-21-28 Geological Applications of New Rem	W83-70516 note Sensing
AEROSOLS Climate Modeling with Emphasis on Aerosols		199-20-72 AEROTHERMODYNAMICS	W83-70425	Techniques 677-41-23	W83-70535
	W83-70249	Computational and Experimental Aerotherod	lynamics W83-70123	AIRBORNE/SPACEBORNE COMPUTERS	1100 7000
146-20-10 V	N83-70250	Entry Vehicle Aerothermodynamics		Data Systems Research and Technology 506-58-13	W83-70196
	N83-70265	506-51-13 Detailed Aerothermal Loads	W83-70124	Data Systems Research and Technology 506-58-1\$	W83-70197
Planetary Atmospheric Composition Structure 154-10-80 v	and History N83-70308	506-51-23 Technology Requirements for Advanced Spac	W83-70125 e Transportation	Data Systems Research and Technology 506-58-16	W83-70198
Planetary Clouds Particulates and Ices 154-30-80 v	W83-70311	Systems 506-63-23	W83-70216	On-line Data Ingest/Staging System 506-58-19	W83-70199
Remote Sensing of Atmospheric Structure	W83-70312	Shuttle Entry Air Data System (SEADS)		Attitude/Orbit Technology 310-10-26	W83-70555
Infrared Experiment Development		506 63-32 Shuttle Infrared Leeside Temperature Sensir		AIRCRAFT BRAKES	VV83-70555
VEGA Balloon Nephelometer Design	W83-70325	506 63-34 AEROTHERMOELASTICITY	W83-70221	Aircraft Landing Dynamics 505-45-23	W83-70092
Global Tropospheric Models	W83-70327	Structures Analysis and Synthesis 506 53-51	W83-70142	AIRCRAFT COMPARTMENTS Operational Problems Fireworthiness and Ci	rashworthiness
176-10-00 V AEROSPACE ENGINEERING	N83-70349	AFRICA Monitoring Large Scale Total Primary F		505-45-11 Aviation Safety Technology - Applied Fluid N	W83-70088
Aerospace Computer Science University Researce 505-37-20	ch W83-70051	Description Processes with AVHRR Imagen		Materials Modeling 505-45-15	w83-70089
Non-Destructive Evaluation and Tribology	V83-70128	AGING (BIOLOGY)	W63-70429	Advanced Transport Operating Systems 534-04-13	W83-70118
Advanced Space Structural Concepts		Medical Operations Longitudinal Studies 199 10-21	W83-70407	Advanced Turboprop Program	
Space Computer Science University Research	V83-70139	Developmental Biology 199 40-22	W83-70432	535-03-12 AIRCRAFT CONFIGURATIONS	W83-70122
506-54-50 V Multidisciplinary Research	V83-70158	AGING (MATERIALS) Composites for Airframe Structures		Computational and Analytical Fluid Dynamics 505-31-03	W83-70003
506-56-20 V AEROSPACE ENVIRONMENTS	V83-70184	505 33-33 Fundamentals of Mechanical Behavior	W83-70025 of Composite	Experimental/Theoretical Aerodynamics 505-31-21	W83-70007
Effects of Space Environment on Composites 506-53-25 v	V83-70132	Matrices 506-53-15	W83-70129	Experimental/Applied Aerodynamics 505-31-23	W83-70008
Space Durable Composites and Thermal Contr		AGROMETEOROLOGY		Supersonic Aerodynamics Configurations Structures & Materials Technology	
Power Systems Management and Distribution	v83-70179	Tropospheric Air Quality - Technology Devel 146 20-10	W83-70250	505-43-43	W83-70078
Radiation Effects and Protection		AIR BREATHING ENGINES Control Theory and Methodology		Hypersonic Propulsion Integration Technology 505-43-82	W83-70081
Radiation Effects and Protection	V83-70424	505 34-02 Hypersonic Propulsion Integration Technolog	W83-70031	High Speed (Super/Hypersonic) Technology 505-43-83	W83-70082
AEROSPACE MEDICINE	V83-70426	505 43-82 AIR CONDITIONING	W83-70081	Aerodynamics/Propulsion Integration 505-45-43	W83-70093
Inflight Medical Support 199-10-00 V	V83-70404	Space Station Life Support Technology 506 64-31	W83-70239	AIRCRAFT CONSTRUCTION MATERIALS Research in Advanced Material Concepts for	or Aeronautics
Operational Laboratory Support 199-10-11 V	V83-70405	AIR JETS Containerless Processing		505-33-10 Life Predicton Fatigue Damage and Environ	W83-70017 mental Effects
Operational Laboratory	V83-70406	179 80-30	W83-70364	in Metals and Composites 505-33-21	W83-70020
Medical Operations Longitudinal Studies		AIR NAVIGATION Advanced Navigation Guidance and Cont		Life Prediction for Structural Materials	
Crew Health Maintenance	V83-70407	505 34-13 AIR POLLUTION	W83-70034	505-33-23 Fire Resistant Composites	W83-70022
Crew Health Maintenance	V83-70409	Upper Atmosphere Research - Field Measure 147 12-00	ements W83-70269	505-33-31 Composites for Airframe Structures	W83-70023
199-10-32 V Systems Habitability Verification	V83-70410	Stratospheric Fourier Spectroscopy at Ne Wavelengths	ear and Mid IR	505-33-33 Rotorcraft Airframe Systems	W83-70025
	V83-70411	147 12-05 Stratospheric Research Field Measureme	W83-70270	505-42-23 Supersonic Aerodynamics Configurations	W83-70065 s Integration
	V83-70412	Millimeter and Submillimeter Radiometry 147-12-06	W83-70271	Structures & Materials Technology 505-43-43	W83-70078
199-20-12 v	V83-70413	Global Tropospheric Models		Aviation Safety Technology - Applied Fluid M	
	V83-70414	176 10-00 Global Tropospheric Modeling of Trace (Materials Modeling 505-45-15	W83-70089
	kness V83-70415	176-10-00 Development of Resonant Ionization Laser S	W83-70350 pectroscopy for	Aircraft Fire Safety Materials Testing 505-45-17	W83-70090
Bone Loss 199-20-31 W	V83-70416	Tropospheric NOx Measurements 176-40-03	W83-70352	Structural Integration 534-03-13	W83-70116
Bone Alterations 199-20-32 W	V83-70417	AIR QUALITY Global Tropospheric Modeling of Trace C	Sas Distribution	AIRCRAFT CONTROL Flight Control Concepts and Reliability Enhance	cement
Muscle Alterations	V83-70418	176-10-00	W83-70350	505-34-01 Aircraft Controls Theory and Applications	W83-70030
Muscle Atrophy	V83-70418 V83-70419	AIR SAMPLING Climate Modeling with Emphasis on Aerosol	S 14/97 70017	505-34-03 Advanced Controls and Guidance	W83-70032
Blood Alterations (Influence of Space flight on		146-10-04 Tropospheric Air Quality - Technology Develo		505-34-11	W83-70033
	V83-70420	146-20-10 Global Tropospheric Modeling of Trace C		Advanced Navigation Guidance and Contro 505-34-13	w83-70034
	V83-70421	176-10-00 AIR TRAFFIC CONTROL	W83-70350	AIRLAB Operations 505-34-23	W83-70035
Fluid and Electrolyte Change 199-20-61 W	V83-70422	Advanced Controls and Guidance 505-34-11	W83-70033	High Performance Aircraft Flight Dynamics & 505-43-13	Controls W83-70071
Fluid and Electrolyte Changes	V83-70423	Crew Cockpit Interface Technology 505-35-23	W83-70039	Integrated Research Aircraft Control (INTERACT)	Technology
Radiation Effects and Protection	V83-70424	Advanced Transport Operating Systems	W83-70039 W83-70118	533-02-41	W83-70105
- Biological-Effects of Particle-Radiation		534-04-13 - Research_Airport Operation		AIRCRAFT DESIGN Experimental/Applied Aerodynamics	W00 7000
199-20-72 W	V83-70425	534-04-16	W83-70119	505-31-23	W83-70008

High-Speed Aerodynamics and Propulsion Into 505-43-23	egration W83-70073	. AIRCRAFT MODELS Forward Swept Wing Support		Rotorcraft Vibration and Noise 532-06-13	W83-70098
Supersonic Propulsion Integration Technology		533-02-83 Highly Maneuverable Aircraft Technology F	W83-70112	AIRPORTS	W03-70030
505-43-42 Supersonic Aerodynamics Configurations	W83-70077 Integration	533-03-11	W83-70114	Community Response to Noise 505-35-13	W83-70037
Structures & Materials Technology 505-43-43	W83-70078	AIRCRAFT NOISE Advanced Structural Analysis Methods		Research Airport Operation 534-04-16	W83-70119
AIRCRAFT ENGINES Burning Fundamentals & Heat Transfer		505-33-53 Community Response to Noise	W83-70029	AIRSPACE Advanced Transport Operating Systems	
505-31-42	W83-70012	505-35-13 Rotorcraft Aeromechanics and Configurations	W83-70037	534-04-13	W83-70118
High Temperature Materials 505-33-12	W83-70018	505-42-11 RSRA Flight Research/Rotors	W83-70064	ALBEDO Planetary Clouds Particulates and Ices	
Engine Dynamics and Aeroelasticity 505-33-42	W83-70027	532-03-11 Rotorcraft Systems Integration	W83-70095	154-30-80 ALGEBRA	W83-70311
Inlets and Nozzles		532-06-11	W83-70096	Mathematics for Engineering and Science 505-31-83	W83-70016
505-40-02 Fan and Compressor Research	W83-70055	Rotorcraft Vibration and Noise 532-06-13	W83-70098	ALGORITHMS	W03-70010
505-40-12 Combustors and Turbines	W83-70056	Advanced Turboprop-Installation Aerodynamic 535-03-11	s W83-70121	Automation Systems Research 506-54-63	W83-70161
505-40-22 Power Transfer Research	W83-70057	Advanced Turboprop Program 535-03-12	W83-70122	Meteorological Parameter Extraction 146-65-00	W83-70254
505-40-42 Engine Systems Research	W83-70059	AIRCRAFT PARTS Flight Support		Numerical Analysis of Remote Sensing Data 146-66-01	W83-70255
505-40-62 Engine Systems Facilities Operations	W83-70061	533-02-91 AIRCRAFT PERFORMANCE	W83-70113	Ocean Optics	
505-40-70	W83-70062	Geodynamics/Flight Dynamics of Powered 505-43-01	Lift Vehicles W83-70068	161-30-00 Attitude/Orbit Technology	W83-70339
Powered Lift Propulsion Technology 505-43-02	W83-70069	High Performance Aircraft Flight Dynamics & 505-43-13		310-10-26 ALIGNMENT	W83-70555
Non-Axisymmetric Nozzle Research 505-43-22	W83-70072	Interagency & Industrial Assistance & Testing		Study of Large Deployable Reflector for Submillimeter Astronomy	Infrared and
Convertible Engine System Technology 532-06-12	W83-70097	505-43-32 Supersonic Aerodynamics Configuration	W83-70075 s Integration	506-62-21	W83-70212
Advanced Fighter Aircraft (F-15) 533-02-21	W83-70102	Structures & Materials Technology 505-43-43	W83-70078	ALL-WEATHER AIR NAVIGATION Rotorcraft Flight Guidance Systems Technological Control of the Contr	gy
Turbine Engine Hot Section Technology (HOS 533-04-12	T) W83-70115	Aerodynamics/Propulsion Integration 505-45-43	W83-70093	532-01-11 Advanced Transport Operating Systems	W83-70094
Energy Efficient Engine Project 535-01-12	W83-70120	Advanced Fighter Technology Inte (AFTI-F-111)	gration/F-111	534-04-13 ALLOCATIONS	W83-70118
Advanced Turboprop Program	W83-70122	533-02-11 F-4C Spanwise Blowing Flight Investigations	W83-70101	JSC General Operations - Geophysics & Geophysics & Geophysics	chemistry
535-03-12 AIRCRAFT EQUIPMENT	W63-70122	533-02-31 F-4 Spanwise Blowing	W83-70103	153-10-40 ALLOYS	W83-70307
AIRLAB Operations 505-34-23	W83-70035	533-02-33	W83-70104	Life Prediction for Structural Materials 505-33-23	W83-70022
Flight Experiments Support 532-07-11	W83-70099	Propulsive-Lift Technology - QSRA Flight Exp 533-02-50	W83-70106	ALTIMETERS Acvirve and Passive Sensor Research	
Flight Support 533-02-91	W83-70113	Powered Lift Systems Technology - Harrier F Program	light Research	506-54-25	W83-70155
Advanced Transport Operating Systems 534-04-13	W83-70118	533-02-51 AFTI/F-16	W83-70107	Research Mission Study - TOPEX 161-10-01	W83-70333
AIRCRAFT FUEL SYSTEMS Burning Fundamentals & Heat Transfer		533-02-61 AIRCRAFT SAFETY	W83-70108	Altimeter Time-Dependent Current Studies 161-20 07	W83-70336
505-31-42 Combustors and Turbines	W83-70012	B-57B Flight Investigation of Environmental F 505-45-01	lazards W83-70083	Gulf of Mexico Circulation Studies 161-20-10	W83-70337
505-40-22	W83-70057	Aircraft Icing Research 505-45-02	W83-70084	ALTITUDE SIMULATION	
Burning Fundamentals & Heat Transfer		Aviation Safety Severe Storm Hazards		OTV Propulsion Performance and Plume C 506-60-49	W83-70211
505-31-42 Combustors and Turbines	W83-70012	505-45-03 Safety · Atmospheric Processes	W83-70085	ALTITUDE TESTS Engine Systems Facilities Operations	
505-40-22 Aircraft Fuel Efficiency Improvement	W83-70057	505-45-09 Operational Problems Fireworthiness and Cr		505-40-70 ALUMINUM ALLOYS	W83-70062
505-45-22 AIRCRAFT GUIDANCE	W83 70091	505-45-11 Aviation Safety Technology - Applied Fluid N	W83-70088 lechanics/Fire	Advanced Structural Alloys 505-33-13	W83-70019
Aircraft Controls Theory and Applications 505-34-03	W83-70032	Materials Modeling 505-45-15	W83-70089	Life Predicton Fatigue Damage and Environ in Metals and Composites	mental Effects
Advanced Controls and Guidance 505-34-11	W83-70033	Aircraft Fire Safety Materials Testing 505-45-17	W83-70090	505-33-21 ANALOG TO DIGITAL CONVERTERS	W83-70020
Advanced Navigation Guidance and Contro		AIRCRAFT SPIN High Performance Aircraft Flight Dynamic		Advanced Technology Image Digitization 656-60 10	W83-70488
505-34-13 AIRLAB Operations		Qualities 505-43-11	W83-70070	High-Speed Signal Processing Research	
505-34-23 Rotorcraft Flight Guidance Systems Technolog		AIRCRAFT STRUCTURES	W63-70070	310-30-70 ANEMIAS	W83-70570
532-01-11 Simulation Facilities Operations	W83-70094	Viscous Drag Reduction and Control 505-31-13	W83-70005	Blood Alterations (Influence of Space flight and Blood-Forming Tissues)	
532-08-11 AIRCRAFT HAZARDS	W83-70100	Experimental/Theoretical Aerodynamics 505-31-21	W83-70007	199-20 51 ANGULAR RESOLUTION	W83-70420
Aircraft Fire Safety Materials Testing 505-45-17	W83-70090	Loads and Aeroelasticity 505-33-43	W83-70028	Gamma Ray Astronomy 188-46-57	W83-70386
AIRCRAFT INSTRUMENTS Crew Cockpit Interface Technology		Advanced Structural Analysis Methods 505-33-53	W83-70029	Advanced Mission Study - Solar X-Ray Pinhol Long Focal Length Coronagraph	
505-35-23 Safety - Atmospheric Processes	W83-70039	Interagency and Industrial Assistance and Tes 505-43-33		188 78-38 ANIMALS	W83-70391
505-45-09	W83-70087	Hypersonic Aeronautics Technology 505-43-81	W83-70080	Developmental Biology 199-40 22	W83-70432
Advanced Controls and Guidance	11/00 70000	High Speed (Super/Hypersonic) Technology 505-43-83		Sample Bank	
505-34-11 Aircraft Landing Dynamics	W83-70033	Aircraft Fire Safety Materials Testing	W83-70082	199-70-32 ANNEALING	W83-70449
505-45-23 F-4C Spanwise Blowing Flight Investigations	W83-70092	505-45-17 AIRCRAFT SURVIVABILITY	W83-70090	Photovoltaic Research and Technology 506-55 42	W83-70170
533-02-31 Support for Forward Swept Wing (X-29A)	W83-70103	Operational Problems Fireworthiness and Cr 505-45-11	ashworthiness W83-70088	ANNUAL VARIATIONS Upper Atmosphere Research - Field Measurer	ments
533-02-81 Advanced Transport Operating Systems	W83-70111	AIRCRAFT TIRES Aircraft Landing Dynamics		147-12-00 Stratospheric Fourier Spectroscopy at Near	W83-70269
534-04-13 AIRCRAFT MAINTENANCE	W83-70118	505-45-23 AIRCRAFT WAKES	W83-70092	Wavelengths 147-12 05	W83-70270
RSRA Flight Research/Rotors 532-03-11	W83-70095	Experimental/Theoretical Aerodynamics 505-31-21	W83 70007	Investigation of Upper Atmosphere Dynamics v Satellite Data	
Flight Experiments Support		Experimental/Applied Aerodynamics 505-31-23	W83-70008	673-31 00	W83-70503
532-07-11 Advanced Fighter Aircraft (F-15)	W83-70099	AIRFOILS	.103.70000	Altimeter Time-Dependent Current Studies	
533-02-21 Flight Support	W83-70102	Experimental/Theoretical Aerodynamics 505-31-21	W83-70007	161-20-07 Time Dependent Fields	W83-70336
533-02-91 Research Airport Operation	W83-70113	Experimental/Applied Aerodynamics 505-31-23	W83-70008	161-20 11 Antenna Arrays	W83-70338
534-04-16 AIRCRAFT MANEUVERS	W83-70119	Life Prediction Fatigue Damage and Environi	mental Effects	Communications Systems Technology Develop 310-20-67	pment W83-70567
F-4 Spanwise Blowing 533-02-33	W83-70104	in Metals and Composites 505-33-21	W83-70020	ANTENNA COMPONENTS Advanced Space Structures Antenna	Technology
AFTI/F-16 533-02-61	W83-70108	Rotorcraft Airframe Systems 505-42-23	W83-70065	Development 506-53-45	W83-70141
	ight Research W83-70114	Rotorcraft Systems Integration 532-06-11	W83-70096	Station Monitor and Control Technology 310-20-68	W83-70568
30				- · - 	

ANTENNA DESIGN	Automation Research and Technolo	gy for Near-Earth Mission	Dynamics of Planetary Atmospheres	
Multiple Beam Antenna Technology Development Pro for Large Aperture Deployable Reflectors	gram Operations 506-54-66	W83-70163	154-20-80 ATMOSPHERIC CHEMISTRY	W83-7031
506-58-23 W83-7			Atmospheric Processes Experiments and S	Systems
Deep Space and Advanced COMSAT Communication	itions 310-40-37	W83-70572	147-10-03	W83-7026
Technology 506-58-25 W83-7	ASTEROIDS		Upper Atmosphere Research - Field Measu	urements W83-7026
Advanced Large Spacecraft Systems Analysis	O2O2 Cross Section Determination Background Determination Neutron		147-11-00	
506-62-23 W83-7	D213 Planetary Evaluation and Dynamic St		147-11-04	W83-7026
Global Weather Research - Microwave Pressure Son	inder 153-03-50	W83-70301	In-Situ Measurements of Stratospheric Ozo	
146-72-01 W83-79 Mobile Satellite Experiment	0258 Experimental Impact Cratering 153-08-40	W83-70304	147-11-05 Upper Atmosphere Research - Field Measu	W83-7026
650-60-00 W83-7	0473 X-Ray Gamma-Ray and Neutron/		147-12-00	W83-7026
Space Communications Systems Antenna Technology	Planetary Exploration	ooming may memode ter	Stratospheric Fourier Spectroscopy at M	Near and Mid I
650-60-20 W83-76	.0. 00 50	W83-70324	Wavelengths 147-12-05	W83-7027
Antenna Systems Development 310-20-65 W83-7	Asteroids 0565 196-41-76	W83-70402	Multi-Sensor Balloon Measurements	W03-7027
ANTENNA FEEDS	Solar System Environments	W03-70402	147-16-01	W83-7027
Multiple Beam Antenna Technology Development Pro	gram 199-50-42	W83-70437		Reaction Rat
for Large Aperture Deployable Reflectors 506-58-23 W83-76	ASTROMETRY		Measurements 147-21-00	W83-7027
Deep Space and Advanced COMSAT Communica		ms W83-70398	Chemical Kinetics of the Upper Atmospher	
Technology	ASTRONAUTS		147-21-03	W83-7027
506-58-25 W83-76 Antenna Systems Development			Photochemistry of the Upper Atmosphere 147-22-01	W83-7027
310-20-65 W83-76	199-10-21 D565 ASTRONOMICAL CATALOGS	W83-70407	Upper Atmosphere Research - Laborator	
ANTENNA RADIATION PATTERNS	Data Analysis Astronomy		147-23-00	W83-7028
Satellite Communications Research and Technology	385-41-01	W83-70463	Infrared Laboratory Spectroscopy in Support	t of Stratospheri
506-58-22 W83-70 Multiple Beam Antenna Technology Development Pro-	THE THE PARTY OF T		Measurements 147-23-08	W83-7028
for Large Aperture Deployable Reflectors	gram Giotto Halley Modeling 156-03-01	W83-70319	Stratospheric Research	***************************************
506-58-23 W83-70	D201 Theoretical Studies of Galaxies Ac		147-30-02	W83-7028
ANTENNAS Composites for Advanced Space Systems	Quasi Stellar Objects	14/02 70201	Upper Atmosphere Research - Theoretical : 147-31-00	W83-7028
506-53-23 W83-70	188-41-53 0131 ASTRONOMICAL OBSERVATORIES	W83-70381	General Circulation Modeling of the Stratos	
Advanced Control Technology	Imaging Studies of Comets		147-32-00	W83-7028
506-57-15 W83-70 Deployable Antenna Flight Experiment	196-41-52	W83-70395	Critical Examination of Upper Stratospheri 147-43-00	ic Measurement W83-7028
906-90-00 W83-70	ASTRONOMICAL PHOTOGRAPHY Ground-Based Observations of the	Sun	Planetary Atmospheric Composition Struct	
ANTHROPOMETRY	188-38-52	W83-70374	154-10-80	W83-7030
Human Factors for Crew Interfaces in Space	ASTRONOMICAL PHOTOMETRY		Planetary Clouds Particulates and Ices	W83-7031
506-57-27 W83-70 ANTIBODIES	154-80-80	W83-70317	154-30-80 Atomic and Molecular Properties of Planet	
General biomedical Research	UV and Optical Astronomy	***************************************	Constituents	•
199-20-92 W83-70	0428 188-41-51	W83-70380	154-50-80	W83-70313
ANTIDOTES Bone Loss	Infrared and Sub-Millimeter Astrono	omy W83-70382	Planetary Aeronomy Theory and Analysis 154-60-80	W83-70314
199-20-31 W83-70	188-41-55 0416 Imaging Studies of Comets	W03-70362	Global Tropospheric Modeling of Trace	
ANTIMISTING FUELS	196-41-52	W83-70395	176-10-00	W83-70350
Operational Problems Fireworthiness and Crashworthi 505-45-11 W83-70	nee		Kinetic Studies Involving CH302 H02 and Tropospheric Importance	d IO Radicals o
APERTURES	9088 656-60-10 Sounding Rockets Experiments (As	W83-70488 tronomy)	176-30-01	W83-7035
Multiple Beam Antenna Technology Development Pro-	gram 879-11-41	W83-70552	Optical Astronomy	
for Large Aperture Deployable Reflectors 506-58-23 W83-70	ASTRONOMICAL SPECTROSCOPY	and Ontrad Astronomy	196-41-71 ATMOSPHERIC CIRCULATION	W83-70399
APPALACHIAN MOUNTAINS (NORTH AMERICA)	J201 Ground-Based Observations UV 188-41-21	W83-70377	Meteorological Satellite Data Research	
Oil and Gas Test Case Study	UV and Optical Astronomy		146-60-00	W83-7025
677-41-16 W83-70 APPROACH		W83-70380	Meteorological Satellite Data Research 146-61-00	and Applications W83-70252
Support for Forward Swept Wing (X-29A)	Infrared and Sub-Millimeter Astrono 188-41-55	W83-70382	Global Weather Experiment Data Processin	
533-02-81 W83-70	0111 Gamma-Ray Astronomy		146-64-00	W83-70253
APPROPRIATIONS Funds for Independent Research (Aeronautics)	188-46-57	W83-70385	Meteorological Parameter Extraction 146-65-00	W83-70254
505-36-11 W83-70	Gamma Ray Astronomy 0042 188-46-57	W83-70386	Meteorological Observing System Developm	
Fund for Independent Research (Aeronautics)	X-Ray Astronomy		146-73-00	W83-70262
505-36-12 W83-70 Class VI Computational Capability Support	100 10 00	W83-70387	Studies of Dynamics of Atmospheric Flows 146-76-00	W83-70264
505-37-31 W83-70	X-Ray Astronomy CCD Instrumenta 188-46-59	W83-70389	Atmospheric Processes Experiments and S	
AQUIFERS	Ground-Based Infrared Astronomy		147-10-03	W83-70265
Digital Mapping of Irrigated Cropland 677-60-11 W83-70	196-41-50	W83-70394	Stratospheric Research 147-30-02	W83-70284
ARCHITECTURE (COMPUTERS)	Advanced Infrared Astronomy and 196-41-54	W83-70396	Upper Atmosphere Research - Theoretical S	
Control Theory and Methodology	Optical Astronomy		147-31-00	W83-7028
505-34-02 W83-70	150	W83-70399	Dynamics of Planetary Atmospheres	W83-70309
Advanced Computational Concepts 505-37-21 W83-70	Radio Astronomy 1052 196-41-73	W83-70400	Dynamics of Planetary Atmospheres	************
Data Systems Research and Technology	Sounding Rocket Experiments (Hi		154-20-80	W83-70310
506-58-13 W83-70 Data Systems Research and Technology	196 879-11-46	W83-70553	Planetary Aeronomy Theory and Analysis 154-60-80	W83-70314
506-58-15 W83-70	ASTRONOMY 197 Application of Digital Image Pro-	cessing Techniques to	Infrared Experiment Development	***************************************
Data Systems Research and Technology	Astronomical Imagery		157-04-80	W83-70325
506-58-16 W83-70 Sciences Directorate Local Area Computer Network		W83-70462	ATMOSPHERIC COMPOSITION High Resolution Laser Research	
656-85-01 W83-70	ASTROPHYSICS Gravitational Wave Astronomy and	Cosmolony	506-54-23	W83-70154
Network Monitor and Control Technology	188-41-22	W83-70378	Tropospheric Air Quality - Technology Deve	elopment
310-30-69 W83-70	569 UV and Optical Astronomy		146-20-10	W83-70250
ARCTIC OCEAN Coupled Active-Passive Sea Ice Analysis	188-41-51 Theoretical Studies of Galaxies Ac	W83-70380	Upper Atmosphere Research - Field Measur 147-11-00	rements W83-70266
161-40-02 W83-70	343 Quasi Stellar Objects	are galactic Hucle: and	Stratospheric Research Balloon Laser In-Si	tu Sensor
ARCTIC REGIONS	188-41-53	W83-70381	147-11-04	W83-70267
Ocean Applications Development Program 161-30-01 W83-70	Particle Astrophysics and Experi		In-Situ Measurements of Stratospheric Ozor 147-11-05	ne W83-70268
ARID LANDS	ATLANTIC OCEAN	W83-70383	Upper Atmosphere Research - Field Measur	rements
Monitoring Large Scale Total Primary Production	and Physical Oceanography		147-12-00	W83-70269
Desertification Processes with AVHRR Imagery 199-30-07 W83-70	161-20-00	W83-70335	Stratospheric Fourier Spectroscopy at Ne	ar and Mid IR
Thematic Mapper Simulator Land Resources Studie			Wavelengths 147-12-05	W83-70270
Western Ecozones	175-13-00	W83-70346	Stratospheric Research Field Measure	
677-21-26 W83-70 Land Resources Applied Research			Millimeter and Submillimeter Radiometry	-
677-21-29 W83-70	Global Weather Research - Micro 1517 146-72-01	wave Pressure Sounder W83-70258	147-12-06	W83-70271
ARRAYS	Planetary Astronomy and Supports	ng Laboratory Research	Pressure Modulator Radiometer 147-12-08	W83-70272
Far Infrared Detectors and Cooled Research	196-41-67	W83-70397	Multi-Sensor Balloon Measurements	
506-54-21 W83-70 ARTIFICIAL INTELLIGENCE	Propagation Studies and Measurem 643-10-03	ents W83-70470	147-16-01	W83-70274
Advanced Concepts for Knowledge-Based Expert Syst	ems SMIRR Data Analysis	1103-70470	Gas Correlation Wind Sensor	was
506-54-61 W83-70	160 677-41-19	W83-70534	147-18-02	W83-70275
Automation Systems Research 506-54-63 W83-70	Radio Systems Development 161 310-20-66	W83-70566	Quantitative Infrared Spectroscopy of Minor the Earth's Stratosphere	constituents of
Automation Technology for Planning Teleoperation	and ATMOSPHERIC_BOUNDARY LAYER	***************************************	147-20-03	W83-70276
Robotics	Safety - Atmospheric Processes	14/00	Photochemistry of the Upper Atmosphere	14/00
506-54-65 W83-70	162 505-45-09	W83-70087	147-22-01	W83-70279

Upper Atmosphere Research - Laboratory N 147-23-00	fleasurements W83-70280
Infrared Laboratory Spectroscopy in Support of	
Measurements 147-23-08	W83-70281
Laser Laboratory Spectroscopy	
147-23-09	W83-70282
Millimeter/Submillimeter Laboratory Spectrosc 147-23-10	W83-70283
Stratospheric Research 147-30-02	W83-70284
Upper Atmosphere Research - Theoretical Stu	dies
147-31-00 Upper Atmosphere Research - Satellite Data A	W83-70285 Analysis
147-41-00	W83-70287
Planetary Atmospheric Composition Structure 154-10-80	and History W83-70308
Dynamics of Planetary Atmospheres 154-20-80	W83-70309
Planetary Clouds Particulates and Ices 154-30-80	W83-70311
Remote Sensing of Atmospheric Structure 154-40-80	W83-70312
Atomic and Molecular Properties of Planetary	Atmospheric
Constituents 154-50-80	W83-70313
Planetary Aeronomy Theory and Analysis 154-60-80	W83-70314
Infrared Experiment Development 157-04-80 Global Tropospheric Models	W83-70325
176-10-00	W83-70349
Global Tropospheric Modeling of Trace Ga 176-10-00	W83-70350
Kinetic Studies Involving CH3O2 HO2 and II Tropospheric Importance	
176-30-01 Development of Resonant Ionization Laser Spe	W83-70351 ectroscopy for
Tropospheric NOx Measurements 176-40-03	W83-70352
Planetary Astronomy and Supporting Laborat	tory Research
196-41-67 Biosphere-Atmosphere Interactions in Wetlani	W83-70397 d Ecosystems
199-30-36	W83-70431
Solar System Environments 199-50-42	W83-70437
ATMOSPHERIC DENSITY Shuttle Upper Atmosphere Mass Spectron	neter (SUMS)
506-63-37	W83-70224
Investigation of Upper Atmosphere Dynamics w Satellite Data	
673-31-00 ATMOSPHERIC EFFECTS	W83-70503
SMIRR Data Analysis	
677-41-19	W83-70534
ATMOSPHERIC ELECTRICITY	W83-70534
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10	W83-70534 W83-70363
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials a	
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials a Evaluation 506-53-31	W83-70363
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials a Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION	W83-70363 nd Systems
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials a Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22	W83-70363 nd Systems W83-70136
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION E: Studies of Dynamics of Atmospheric Flows	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials a Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EX Studies of Dynamics of Atmospheric Flows 146-76-00	W83-70363 nd Systems W83-70136
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EX	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EVALUATION Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC MEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EVALUATION EVALUATION Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-33-33	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EX Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70310
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EX Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70310 W83-70041
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EVALUATION STATES Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70310 W83-70041 W83-70249
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION E Studies of Dynamics of Atmosphenic Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Stud	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70310 W83-70041 W83-70249 W83-70251 W83-70284 dies
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION ETMOSPHERIC MOPERAL CIRCULATION ETMOSPHERIC MOPERAL Studies 146-76-00 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratosphere	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70310 W83-70041 W83-70249 W83-70251 W83-70284 dies W83-70285 rice
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION Electron Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC MEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheria- 147-32-00	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70210 W83-70249 W83-70251 W83-70285 ref W83-70286
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION E Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studians 147-31-00 General Circulation Modeling of the Stratosphere 147-32-00 Upper Atmosphere Research - Satellite Data Att-74-100	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70210 W83-70249 W83-70251 W83-70285 ref W83-70286
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION E Studies of Dynamics of Atmosphene Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratosphene Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratosphere 147-32-00 Upper Atmosphere Research - Satellite Data Attantal Company of Control Contro	W83-70363 nd Systems W83-70136 W83-70136 W83-70264 W83-70264 W83-70241 W83-70249 W83-70286 w83-70286 w83-70286 w83-70287 W83-70287
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EX Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric Atmosphere Research - Satellite Data Atmosphere Atmosphere Research 147-31-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80	W83-70363 nd Systems W83-70136 W83-70136 W83-70264 W83-70264 W83-70241 W83-70249 W83-70286 w83-70286 w83-70286 w83-70287 W83-70287
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC ENTRY SIMULATION Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric Arthogological Satellite Data Attachio-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70249 W83-70249 W83-70285 ere W83-70285 ere W83-70285 ere W83-70286 knalysis W83-70287
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION ESTATE Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratosphere 147-32-00 Upper Atmosphere Research - Satellite Data Att-741-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Clouds Particulates and Ices	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70210 W83-70249 W83-70251 W83-70249 W83-70285 ree W83-70286 ree w83-70286 ree w83-70287 W83-70287 W83-70287
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION EXITY Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric 147-32-00 Upper Atmosphere Research - Satellite Data Atlandary 147-31-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Clouds Particulates and ices 154-30-80 Planetary Aeronomy Theory and Analysis	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70210 W83-70251 W83-70251 W83-70285 ere W83-70286 malysis w83-70287 W83-70287 W83-70308 W83-70308
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION ES Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric Arthospheric Research 147-32-00 Upper Atmosphere Research - Satellite Data Atta-7-31-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Aeronomy Theory and Analysis 154-30-80 Planetary Aeronomy Theory and Analysis	W83-70363 nd Systems W83-70136 W83-70408 KPERIMENT W83-70264 W83-70241 W83-70249 W83-70285 see W83-70286 malysis W83-70287 W83-70287 W83-70308 W83-70308 W83-70309
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION ES Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC MEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric Ary 32-00 Upper Atmosphere Research - Satellite Data Att 47-41-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Atmospheric Composition Structure 154-30-80 Planetary Aeronomy Theory and Analysis 154-60-80 Extended Atmospheres 154-80-80 Severe Storms and Local Weather Research	W83-70363 nd Systems W83-70136 W83-70136 W83-70408 KPERIMENT W83-70264 W83-70241 W83-70249 W83-70285 re W83-70286 nalysis W83-70287 W83-70287 W83-70311 W83-70311 W83-70311
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC ENTRY SIMULATION Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospherics 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric Atr-30-00 Upper Atmosphere Research - Satellite Data Atr-41-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Clouds Particulates and Ices 154-30-80 Planetary Clouds Particulates and Ices 154-30-80 Extended Atmospheres 154-80-80 Severe Storms and Local Weather Research 175-13-00 Global Tropospheric Models	W83-70363 nd Systems W83-70136 W83-70136 W83-70204 W83-70210 W83-70249 W83-70249 W83-70285 ere W83-70285 ere W83-70280 W83-70280 w83-70280 w83-70310 W83-70311 W83-70311 W83-70311 W83-70314 W83-70316 W83-70316
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION Electric Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospher 147-32-00 Upper Atmosphere Research - Satellite Data Att 147-41-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Admospheres 154-30-80 Planetary Afmospheres 154-80-80 Extended Atmospheres 154-80-80 Severe Storms and Local Weather Research 175-13-00 Global Tropospheric Modeling of Trace Gai	W83-70363 nd Systems W83-70136 W83-70136 W83-70204 W83-70210 W83-70249 W83-70251 W83-70285 rec w83-70285 rec w83-70286 rec w83-70286 rec w83-70308 W83-70308 W83-70308 W83-70309 W83-70311 W83-70311 W83-70314 W83-70316 W83-70349 s Distribution
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION Electric Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratosphere 147-32-00 Upper Atmosphere Research - Satellite Data Att 147-41-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Atmospheres 154-30-80 Planetary Aeronomy Theory and Analysis 154-60-80 Extended Atmospheres 154-80-80 Severe Storms and Local Weather Research 175-13-00 Global Tropospheric Modeling of Trace Gai	W83-70363 nd Systems W83-70136 W83-70136 W83-70408 KPERIMENT W83-70264 W83-70241 W83-70249 W83-70251 W83-70285 Ere W83-70287 W83-70287 W83-70287 W83-70311 W83-70311 W83-70311 W83-70316 W83-70316 W83-70316 W83-70346 W83-70349 s Distribution W83-70350
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION ES Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC GENERAL CIRCULATION ES Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospheric Atmosphere Research - Satellite Data Ad 147-41-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Clouds Particulates and Ices 154-30-80 Planetary Aeronomy Theory and Analysis 154-60-80 Extended Atmospheres 154-80-80 Severe Storms and Local Weather Research 175-13-00 Global Tropospheric Modeling of Trace Gat 176-10-00 Variability and Trends in Stratospheric Coone Atmosphere and UV Solar Flux Variations	W83-70363 nd Systems W83-70136 W83-70136 W83-70136 W83-70264 W83-70249 W83-70249 W83-70249 W83-70285 ere W83-70285 ere W83-70285 w83-70280 w83-70310 W83-70311 W83-70314 W83-70316
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION Electric Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratospherial-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	W83-70363 nd Systems W83-70136 W83-70136 W83-70408 KPERIMENT W83-70264 W83-70241 W83-70249 W83-70251 W83-70285 Ere W83-70287 W83-70287 W83-70287 W83-70311 W83-70311 W83-70311 W83-70316 W83-70316 W83-70316 W83-70346 W83-70349 s Distribution W83-70350
ATMOSPHERIC ELECTRICITY Cloud Physics 179-75-10 ATMOSPHERIC ENTRY Thermal Protection Systems Materials at Evaluation 506-53-31 ATMOSPHERIC ENTRY SIMULATION Longitudinal Studies 199-10-22 ATMOSPHERIC GENERAL CIRCULATION ES Studies of Dynamics of Atmospheric Flows 146-76-00 ATMOSPHERIC HEATING Dynamics of Planetary Atmospheres 154-20-80 ATMOSPHERIC MODELS Flight Simulation Technology 505-35-33 Climate Modeling with Emphasis on Aerosols 146-10-04 Meteorological Satellite Data Research 146-60-00 Stratospheric Research 147-30-02 Upper Atmosphere Research - Theoretical Studies 147-31-00 General Circulation Modeling of the Stratosphere 147-32-00 Upper Atmosphere Research - Satellite Data Att-41-00 Data Survey and Evaluation 147-51-02 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-20-80 Planetary Atmospheric Composition Structure 154-10-80 Dynamics of Planetary Atmospheres 154-80-80 Extended Atmospheres 154-80-80 Severe Stroms and Local Weather Research 175-13-00 Global Tropospheric Modeling of Trace Gat 176-10-00	W83-70363 nd Systems W83-70136 W83-70136 W83-70136 W83-70264 W83-70249 W83-70249 W83-70249 W83-70285 ere W83-70285 ere W83-70285 w83-70280 w83-70310 W83-70311 W83-70314 W83-70316

Global Weather Research - Advanced Moisture and Temperature Sounder (AMTS)	ı
146-72-02 W83-70259 Advanced Microwave Sensing of Meteorological	
Parameters	
146-72-05 W83-70261 Meteorological Lidar Development	l
146-74-01 W83-70263 Atmospheric Processes Experiments and Systems	3
147-10-03 W83-70265	ō
TMOSPHERIC PHYSICS Studies of Dynamics of Atmospheric Flows	
146-76-00 W83-70264 Upper Atmosphere Research - Field Measurements	ŀ
147-11-00 W83-70266	š
Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269	•
Stratospheric Research 147-30-02 W83-70284	
Upper Atmosphere Research - Theoretical Studies	
147-31-00 W83-70285 General Circulation Modeling of the Stratosphere	
147-32-00 W83-70286 Upper Atmosphere Research - Satellite Data Analysis	;
147-41-00 W83-70287	
Planetary Atmospheric Composition Structure and History 154-10-80 W83-70308	
Dynamics of Planetary Atmospheres 154-20-80 W83-70309	•
Dynamics of Planetary Atmospheres 154-20-80 W83-70310	
Planetary Aeronomy Theory and Analysis	
154-60-80 W83-70314 Extended Atmospheres	ŀ
154-80-80 W83-70316 Climate Research Program Support	3
672-50-06 W83-70497	,
TMOSPHERIC PRESSURE B-57B Flight Investigation of Environmental Hazards	
505-45-01 W83-70083 Meteorological Observing System Development	j
146-70-00 W83-70256	
Global Weather Research - Microwave Pressure Sounder 146-72-01 W83-70258	
DASIBI Measurement of Ozone Profile and Column-Content	
673-11-00 W83-70498	š
TMOSPHERIC RADIATION Meteorological Observing System Development	
146-70-00 W83-70256	š
Solar Flux in Upper Atmosphere 147-15-00 W83-70273	3
General Circulation Modeling of the Stratosphere 147-32-00 W83-70286	3
Climate Program Support	
672-50-00 W83-70496	,
TMOSPHERIC SOUNDING	
Meteorological Satellite Data Research	
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction	
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data	ı
Meteorological Satellite Data Research W83-70251 146-60-00 W83-70251 Meteorological Parameter Extraction W83-70254 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data W83-70255 46-66-01 W83-70255	ı
Meteorological Satellite Data Research	ı.
Meteorological Satellite Data Research) 5
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data 146-66-01 W83-70256 Meteorological Observing System Development 146-70-00 W83-70256 Verification and Analysis of Satellite Derived Products	1 5 6
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data 146-66-01 W83-70255 Meteorological Observing System Development 146-70-00 W83-70256 Verification and Analysis of Satellite Derived Products 146-71-00 W83-70257 Upper Atmosphere Research - Field Measurements 147-12-00 W83-70268 Stratospheric Research Field Measurements Program	1 5 6
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data 146-66-01 W83-70256 Meteorological Observing System Development 146-70-00 W83-70256 Verification and Analysis of Satellite Derived Products 146-71-00 W83-70250 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 W83-70271) ;
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 Wenfloation and Analysis of Satellite Derived Products 146-71-00 Wensor Statellite Derived Products 146-71-00 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 Pressure Modulator Radiometer 147-12-08 W83-70272	5 5 7
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 W83-70256 Meteorological Observing System Development 146-70-00 Verification and Analysis of Satellite Derived Products 146-71-00 Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 Pressure Modulator Radiometer 147-12-08 W83-70271 TMOSPHERIC TEMPERATURE	5 5 7
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data 146-66-01 W83-70256 Meteorological Observing System Development 146-70-00 W83-70250 Verification and Analysis of Satellite Derived Products 146-71-00 W83-70250 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 Pressure Modulator Radiometer 147-12-08 W83-70272 TMOSPHERIC TEMPERATURE B-578 Flight Investigation of Environmental Hazards 505-45-01	1 5 6 7 9
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 W83-70256 Werification and Analysis of Satellite Derived Products 146-71-00 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 W83-70271 Pressure Modulator Radiometer 147-12-08 W83-70272 TMOSPHERIC TEMPERATURE B-57B Flight Investigation of Environmental Hazards	1 5 6 7 9
Meteorological Satellite Data Research 146-60-00 W83-70251 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data 146-66-01 W83-70256 Meteorological Parameter Extraction 146-65-00 W83-70256 Meteorological Observing System Development 146-70-00 W83-70256 Verification and Analysis of Satellite Derived Products 146-71-00 W83-70257 Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 W83-70271 147-12-08 W83-70271 147-12-08 W83-70272 147-12-08 W83-70273 148-71-71-71-71-71-71-71-71-71-71-71-71-71-	1 5 5 7 9
Meteorological Satellite Data Research 146-60-00 W83-70251 Meteorological Parameter Extraction 146-65-00 W83-70254 Numerical Analysis of Remote Sensing Data 146-66-01 W83-70256 Meteorological Observing System Development 146-70-00 W83-70256 146-71-00 W83-70257 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 Pressure Modulator Radiometer 147-12-08 147-12-08 147-12-08 1505-45-01 Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 Aircraft Fuel Efficiency Improvement 505-45-22 W83-70091	1 5 5 7 9
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 Wenfloation and Analysis of Satellite Derived Products 146-71-00 Wensor Wensor Satellite Derived Products 146-71-00 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 Pressure Modulator Radiometer 147-12-08 W83-70272 TMOSPHERIC TEMPERATURE 8-578 Flight Investigation of Environmental Hazards 505-45-01 Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 Aircraft Fuel Efficiency Improvement 505-45-22 Meteorological Satellite Data Research and Applications 148-37-005	1 5 6 7 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 Wenflication and Analysis of Satellite Derived Products 146-71-00 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-08 W83-70259 TMOSPHERIC TEMPERATURE B-57B Flight Investigation of Environmental Hazards 505-45-01 Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 Aircraft Fuel Efficiency Improvement 505-45-05 Meteorological Satellite Data Research and Applications 146-61-00 Meteorological Parameter Extraction	
Meteorological Satellite Data Research	
Meteorological Satellite Data Research W83-70251	
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 Verification and Analysis of Satellite Derived Products 146-71-00 Upper Atmosphere Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-06 Pressure Modulator Radiometer 147-12-08 883-70271 747-12-08 W83-70272 TMOSPHERIC TEMPERATURE 8-578 Flight Investigation of Environmental Hazards 505-45-01 Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 Aircraft Fuel Efficiency Improvement 505-45-05 Meteorological Satellite Data Research and Applications 146-61-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 148-66-01 Global Weather Research - Advanced Moisture and	
Meteorological Satellite Data Research 146-60-00 W83-70251	
Meteorological Satellite Data Research 146-60-00 W83-70251	
Meteorological Satellite Data Research W83-70251	1
Meteorological Satellite Data Research 146-60-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Meteorological Observing System Development 146-70-00 Wenfication and Analysis of Satellite Derived Products 146-71-00 Wender Products 147-12-00 Stratospheric Research - Field Measurements 147-12-00 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry 147-12-08 W83-70272 147-13-08 W83-70272 147-13-08 W83-70272 147-13-08 W83-70272 Meteorological Satellite Data Research and Applications W83-70252 Meteorological Parameter Extraction 146-61-00 Meteorological Parameter Extraction 146-65-00 Numerical Analysis of Remote Sensing Data 146-66-01 Global Weather Research - Advanced Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteorological 146-72-05 Gas Correlation Wind Sensor 147-18-02 Upper Atmosphere Research - Satellite Data Analysis	
Meteorological Satellite Data Research W83-70251	
Meteorological Satellite Data Research 146-60-00 W83-70251	
Meteorological Satellite Data Research M83-70251	
Meteorological Satellite Data Research M83-70251	
Meteorological Satellite Data Research 146-60-00 W83-70251	
Meteorological Satellite Data Research 146-60-00 W83-70251 W83-70251 W83-70251 W83-70255 W83-70271 W83-70271	
Meteorological Satellite Data Research	
Meteorological Satellite Data Research W83-70251	

ATMOSPHERIC TURBULENCE	
B-57B Flight Investigation of Environmental Ha 505-45-01	azards W83-70083
Aviation Safety Severe Storm Hazards 505-45-03	W83-70085
Safety Atmospheric Processes 505-45-09	W83-70087
High Resolution Laser Research 506-54-23	W83-70154
Shuttle Time and Frequency Transfer Experi 676-59-41	ment (STIFT) W83-70512
ATOMIC COLLISIONS	
Experiment Development - Laboratory and The Physics 188-38-53	W83-70376
ATROPHY Muscle Alterations	
199-20-41 Muscle Atrophy	W83-70418
199-20-42 ATS	W83-70419
Applications Experiments Program Support 646-41-02	W83-70472
ATTACK AIRCRAFT High-Speed Aerodynamics and Propulsion Inte	
505-43-23 ATTITUDE (INCLINATION)	W83-70073
Attitude Tracker Feasibility Study 677-29-17	W83-70525
ATTITUDE CONTROL Advanced Control Technology	
506-57-15 Attitude/Orbit Technology	W83-70186
310-10-26 AUTOMATIC CONTROL	W83-70555
Advanced Controls and Guidance 505-34-11	W83-70033
Advanced Concepts for Knowledge-Based Ex 506-54-61	pert Systems W83-70160
Automation Research and Technology for Near- Operations	Earth Mission
506-54-66 Automations Technology for Manned Space Sy	
506-54-67 Multi-100 kW Low Cost Earth Orbital Systems	
506-55-79 Automation of Space Transportation Systems 506-63-27	W83-70183 W83-70217
Spacecraft System Technology 506-64-15	W83-70231
Station Monitor and Control Technology 310-20-68	W83-70568
Mission Operations Technology 310-40-45	W83-70573
AUTOMATIC FLIGHT CONTROL Flight Control Concepts and Reliability Enhance	
505-34-01 High Performance Aircraft Flight Dynamics & (505-43-13	W83-70030 Controls W83-70071
Rotorcraft Flight Guidance Systems Technologi 532-01-11	
AFTI/F-16 533-02-61	W83-70108
OEX-Advanced Autopilot 506-63-42	W83-70227
AUTOMATIC LANDING CONTROL Advanced Controls and Guidance	
505-34-11 AUTOMATIC PILOTS	W83-70033
OEX-Advanced Autopilot 506-63-42	W83-70227
Electric Propulsion Technology	
Advanced Manned Vehicle Onboard Propulsion	W83-70168 Technology
Flight Test of an Ion Auxiliary Propulsion Sy	
542-05-12 AVALANCHE DIODES Global Weather Research - Microwave Press	W83-70248
146-72-01 AVIONICS	W83-70258
Advanced Navigation Guidance and Control 505-34-13	s Technology W83-70034
	W83-70035
	W83-70071
Radio Technical Commission for Aeronautics (F 534-04-10	RTCA) W83-70117
High Energy Upper Stage 906-63-00	w83-70582
В	

BB-57 AIRCRAFT
B-578 Flight Investigation of Environmental Hazards
505-45-01 W83-70083
BACKGROUND RADIATION
Cross Section Determination Cosmic Ray Induced
Background Determination Neutron Transport Calculation and
Planetary Evaluation and Dynamic Studies
153-03-50 W83-70301
BACKSCATTERING
Tropospheric Wind Measurement Assessment
146-72-04 W83-70260
Critical Examination of Upper Stratospheric Measurements
147-43-00 W83-70288

Spectroscopic Properties of the Stratospher		Space Motion Sickness		BLOOD FLOW	
147-44-00	W83-70289	199-20-21	W83-70414	Crew Health Maintenance	W83-70410
Ocean Advanced Studies 161-10-00	W83-70332	Bone Alterations 199-20-32	W83-70417	199-10-32 BLOOD PLASMA	
Coupled Active-Passive Sea Ice Analysis 161-40-02	W83-70343	Muscle Alterations	W83-70418	Blood Alterations (Influence of Space flight and Blood-Forming Tissues)	on the Blood
Long Wavelength Subsurface Sounder 677-29-23	W83-70528	199-20-41 Muscle Atrophy		199-20-51 BLOOD VOLUME	W83-70420
Airborne Radar Operations		199-20-42 Blood Alterations (Influence of Space fli	W83-70419	Blood Alterations (Influence of Space flight	on the Blood
677-47-03 BACKWARD WAVE TUBES	W83-70544	and Blood-Forming Tissues)	-	and Blood-Forming Tissues) 199-20-51	W83-70420
Submillimeter & Optical Processing Device 506-54-12	Research W83-70148	199-20-51 Blood Alterations	W83-70420	BODY FLUIDS Cardiovascular Deconditioning (JSC)	
BALLOON SOUNDING		199-20-52	W83-70421	199-20-11	W83-70412
Atmospheric Processes Experiments and St 147-10-03	ystems W83-70265	Fluid and Electrolyte Change 199-20-61	W83-70422	Fluid and Electrolyte Change 199-20-61	W83-70422
Upper Atmosphere Research - Field Measur 147-11-00	ements W83-70266	Fluid and Electrolyte Changes	14/00 70400	Fluid and Electrolyte Changes	W83-70423
Stratospheric Research Field Measurem		199-20-62 Radiation Effects and Protection	W83-70423	BODY-WING CONFIGURATIONS	W03-70423
Millimeter and Submillimeter Radiometry 147-12-06	W83-70271	199-20-71 Biological Effects of Particle Radiation	W83-70424	Detailed Aerothermal Loads 506-51-23	W83-70125
Pressure Modulator Radiometer 147-12-08	W83-70272	199-20-72	W83-70425	BOLOMETERS Infrared and Sub-Millimeter Astronomy	
Multi-Sensor Balloon Measurements		Radiation Effects and Protection 199-20-76	W83-70426	188-41-55	W83-70382
147-16-01 BALLOON-BORNE INSTRUMENTS	W83-70274	General biomedical Research 199-20-92	W83-70428	BONE DEMINERALIZATION Bone Alterations	
Upper Atmosphere Research - Field Measur 147-11-00	ements W83-70266	Advanced Life Support Systems	W83-70440	199-20-32 BONES	W83-70417
Stratospheric Research Balloon Laser In-Si	tu Sensor	199-60-11 Advanced Life Support Systems		Bone Loss	W02 70416
147-11-04 In-Situ Measurements of Stratospheric Ozor	W83-70267 ne	199-60-12 Advanced Extravehicular Systems (Space	W83-70441 Suit)	199-20-31 Bone Alterations	W83-70416
147-11-05 Upper Atmosphere Research - Field Measur	W83-70268	199-60-21	W83-70442	199-20-32 BOOMS (EQUIPMENT)	W83-70417
147-12-00	W83-70269	Advanced Extravehicular Systems 199-60-22	W83-70443	Advanced Space Structures Antenna	Technology
Stratospheric Fourier Spectroscopy at N Wavelengths		Cosmos Flight Experiments Project 199-70-12	W83-70448	Development	W83-70141
147-12-05 Stratospheric Research Field Measurem	W83-70270	Vestibular Research Facility (VRF)/Variable Facility (VGRF)	Gravity Research	BOOSTER RECOVERY Interagency Assistance and Testing - Dryden	
Millimeter and Submillimeter Radiometry	•	199-80-32	W83-70451	505-43-31	W83-70074
147-12-06 Pressure Modulator Radiometer	W83-70271	Interdisciplinary Research 199-90-71	W83-70456	BOOSTER ROCKET ENGINES Reusable High Pressure Main Engine Technol	
147-12-08 Multi-Sensor Balloon Measurements	W83-70272	Ames Research Center Initiatives 199-90-72	W83-70457	506-60-19 BOUNDARY LAYER STABILITY	W83-70208
147-16-01	W83-70274	BIOCHEMISTRY	1100 70407	Boundary-Layer Stability and Transition Reser	arch W83-70006
Laser Laboratory Spectroscopy 147-23-09	W83-70282	Bioseparation Processes 179-80-40	W83-70365	BOUNDARY LAYER TRANSITION	W63-70006
VEGA Balloon Nephelometer Design 157-04-80	W83-70327	Basic Mechanisms Underlying Space Moti 199-20-22	ion Sickness W83-70415	Viscous Drag Reduction and Control 505-31-13	W83-70005
Gamma Ray Astronomy and Related Resear 188-46-57		Bone Loss		Boundary-Layer Stability and Transition Resea	w83-70006
Gamma-Ray Astronomy		199-20-31 Biological Adaptation	W83-70416	BOUNDARY LAYERS	W83-70000
188-46-57 DASIBI Measurement of Ozone	W83-70385 Profile and	199-40-32 Origin and Evolution of Life	W83-70433	Computational and Analytical Fluid Dynamics 505-31-03	W83-70003
Column-Content 673-11-00	W83-70498	199-50-32	W83-70436	BOUNDARY VALUE PROBLEMS Boundary-Layer Stability and Transition Research	arch
Correlative Measurement Improvements		Food Requirements Production and Prod 199-60-42	W83-70444	505-31-15	W83-70006
673-18-00 BANDWIDTH	W83-70502	BIODEGRADATION Waste Management for CELSS		BRAGG ANGLE Development of Experiment and Hardware	
Multifunction SAR Technology 506-54-27	W83-70157	199-60-52	W83-70445	188-38-51 BRAKING	W83-70371
Communications Satellite New Applicat		BIOGEOCHEMISTRY Global Ecology		Advanced Transportation	11100 70500
Studies		199-30-31	W83-70430	906-63-00	W83-70583
643-10-02	W83-70469	Biosphere-Atmosphere Interactions in We	etland Ecosystems	BREATHING APPARATUS	
BAROCLINIC INSTABILITY	W83-70469	Biosphere-Atmosphere Interactions in We	etland Ecosystems W83-70431	Advanced Extravehicular Systems (Space Suit	
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 146-76-00	W83-70469 W83-70264	199-30-36 Organic Geochemistry 199-50-22		Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE	t) W83-70442
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows	W83-70264	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION	W83-70431	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09	
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 146-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainnous Terrain	W83-70264	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31	W83-70431 W83-70435 W83-70450	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT	W83-70442 W83-70492
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS)	W83-70264 trally Vegetated W83-70530	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42	W83-70431 W83-70435 W83-70450	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05	W83-70442 W83-70492
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Ex	W83-70264 tially Vegetated W83-70530 ments (DATE)	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS	W83-70431 W83-70435 W83-70450 Program Definition W83-70452	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn	W83-70442 W83-70492 In Productivity W83-70341 ology
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program)	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10	W83-70431 W83-70435 W83-70450 Program Definition W83-70452	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acousto-Optic & Submillimeter Device Techn 506-54-16	W83-70442 W83-70492 In Productivity W83-70341
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS	W83-70264 tially Vegetated W83-70530 ments (DATE)	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31	W83-70431 W83-70435 W83-70450 Program Definition W83-70452 velopment	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services	W83-70442 W83-70492 In Productivity W83-70341 In Productivity W83-70151
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Exceriment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70250	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utifization Studies	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70466
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 146-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX W83-70225	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70250 W83-70409 W83-70425	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-0-5 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01	W83-70442 W83-70492 In Productivity W83-70341 In Productivity W83-70151
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Dynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST	W83-70264 thally Vegetated W83-70530 ments (DATE) erificationOEX W83-70225	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70450 W83-70409 W83-70426	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere	W83-70442 W83-70492 an Productivity W83-70341 ology W83-70151 W83-70466 W83-70467
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX W83-70225	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70250 W83-70409 W83-70425	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utifization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70466
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies	W83-70264 titally Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70059 W83-70210	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70409 W83-70425 W83-70426 W83-70455	Advanced Extravehicular Systems (Space Suit 193-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acousto-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03	W83-70442 W83-70492 an Productivity W83-70341 ology W83-70151 W83-70466 W83-70467
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Dynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC)	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70210 W83-70408 W83-70410	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70450 W83-70409 W83-70425 W83-70426 W83-70426 W83-70432	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes	W83-70264 tually Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70210 W83-70408 W83-70410 W83-70412	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Organic Geochemistry	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70450 W83-70425 W83-70425 W83-70426 W83-70435	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70210 W83-70408 W83-70410	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Orgin and Evolution of Life 199-50-32	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70450 W83-70409 W83-70425 W83-70426 W83-70426 W83-70432	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57	W83-70442 W83-70492 sin Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278 W83-70196
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-22 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials	W83-70264 trially Vegetated W83-70530 ments (DATE) errificationOEX W83-70225 W83-70210 W83-70408 W83-70410 W83-70412 W83-70423	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-10-31 Biological Effects and Protection 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-52	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70450 W83-70425 W83-70425 W83-70426 W83-70435	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278 W83-70196 W83-70353
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Flud and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 506-53-17 BERING SEA	W83-70264 tually Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70210 W83-70408 W83-70410 W83-70412	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-50-72	W83-70431 W83-70450 Program Definition W83-70452 velopment W83-70459 W83-70425 W83-70425 W83-70426 W83-70436 W83-70436	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57	W83-70442 W83-70492 an Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278 W83-70196
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00	W83-70264 trially Vegetated W83-70530 ments (DATE) errificationOEX W83-70225 W83-70210 W83-70408 W83-70410 W83-70412 W83-70423	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70450 W83-70409 W83-70425 W83-70426 W83-70432 W83-70432 W83-70435 W83-70438 W83-70438	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utifization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53	W83-70442 W83-70492 sin Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70196 W83-70353 W83-70353
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology of Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 Variable Thrust OTV Propulsion Technology 506-60-42 EED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Monterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY	W83-70264 titally Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70059 W83-70210 W83-70408 W83-70410 W83-70412 W83-70423 W83-70130	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-10-31 Biological Effects and Protection 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-50-72 BIOMASS Land Use and Techniques for Monitoring Lain Biomass	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70250 W83-70409 W83-70425 W83-70426 W83-70455 W83-70432 W83-70432 W83-70438 W83-70436 W83-70436	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustics Applications to Ocea 161-30-05 BROADCASTING Technical Consultation Services 643-10-01 Specitrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods	W83-70442 W83-70492 sin Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70196 W83-70353 W83-70353
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 506-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72	W83-70264 titally Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70059 W83-70210 W83-70408 W83-70410 W83-70412 W83-70423 W83-70130	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-50-72 BIOMASS Land Use and Techniques for Monitoring La In Biomass 677-21-30 BIOMEDICAL DATA	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70450 W83-70409 W83-70425 W83-70426 W83-70432 W83-70432 W83-70435 W83-70438 W83-70438	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utifization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53	W83-70442 W83-70492 sin Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70196 W83-70353 W83-70353
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-61 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies	W83-70264 tually Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70225 W83-70210 W83-70408 W83-70410 W83-70412 W83-70423 W83-70423 W83-70423	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-32 Ames Research Center Initiatives 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 17-21-30	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70250 W83-70409 W83-70425 W83-70426 W83-70455 W83-70432 W83-70432 W83-70438 W83-70436 W83-70436	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocei 161-30-05 BROADBAND Acousto-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53	W83-70442 W83-70492 an Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278 W83-70196 W83-70353 W83-70358
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 506-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72 BIOASTRONAUTICS Medical Operations Longitudinal Studies 199-10-21	W83-70264 tually Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70225 W83-70210 W83-70408 W83-70410 W83-70412 W83-70423 W83-70423 W83-70423	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Troposphenic Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70455 W83-70425 W83-70426 W83-70455 W83-70432 W83-70435 W83-70436 W83-70436 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438	Advanced Extravehicular Systems (Space Suit 199-60-21) BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38 C-47 AIRCRAFT	W83-70442 W83-70492 sin Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70196 W83-70353 W83-70353
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Exceriment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72 BIOASTRONAUTICS Medical Operations Longitudinal Studies 199-10-21 Longitudinal Studies	W83-70264 tually Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70210 W83-70410 W83-70410 W83-70412 W83-70423 W83-70430 W83-70354	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-32 BIOSENTHESIS	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70450 W83-70425 W83-70425 W83-70426 W83-70432 W83-70432 W83-70435 W83-70436 W83-70438 W83-70438 W83-70438	Advanced Extravehicular Systems (Space Suit 193-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acousto-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38	W83-70442 W83-70492 an Productivity W83-70341 ology W83-70151 W83-70466 W83-70467 W83-70278 W83-70196 W83-70353 W83-70358
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 505-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASAV Bioprocessing Studies 179-13-72 BIOASTRONAUTICS Medical Operations Longitudinal Studies 199-10-21 Longitudinal Studies 199-10-21 Longitudinal Studies	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70059 W83-70210 W83-70408 W83-70410 W83-70412 W83-70412 W83-70423 W83-70354 W83-70354 W83-70408	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Urganic Geochemistry 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-50-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-32 BIOSYNTHESIS Bioseparation Processes	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 Velopment W83-70455 W83-70425 W83-70426 W83-70455 W83-70432 W83-70435 W83-70436 W83-70436 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utifization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38 C-47 AIRCRAFT Flight Support 533-02-91 CALCIUM METABOLISM	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70278 W83-70353 W83-70353 W83-70358
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Exceriment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72 BIOASTRONAUTICS Medical Operations Longitudinal Studies 199-10-21 Longitudinal Studies 199-10-21 Crew Health Maintenance	W83-70264 taily Vegetated W83-70530 ments (DATE) enficationOEX W83-70225 W83-70225 W83-70210 W83-70408 W83-70412 W83-70412 W83-704130 W83-70423 W83-70354 W83-70407 W83-70408 W83-70409	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Troposphenic Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Life in the Universe 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-32 BIOSYNTHESIS Bioseparation Processes 179-80-40 BLACK HOLES (ASTRONOMY)	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 velopment W83-70250 W83-70425 W83-70425 W83-70426 W83-70432 W83-70432 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438 W83-70437 W83-70439	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utifization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38 C-47 AIRCRAFT Flight Support 533-02-91 CALCIUM METABOLISM Bone Loss 199-20-31	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70278 W83-70353 W83-70353 W83-70358
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 146-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Dynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 506-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Cardiovascular Deconditioning (JSC) 199-20-61 Fluid and Electrolyte Changes 199-10-62 BENEFICIATION Refining of Nonterrestrial Materials 506-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72 179-13-72 189-10-21 Longitudinal Studies 199-10-21 Longitudinal Studies 199-10-21 Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-31 Crew Health Maintenance	W83-70264 tially Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70059 W83-70210 W83-70408 W83-70410 W83-70412 W83-70412 W83-70423 W83-70354 W83-70354 W83-70408	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Troposphenic Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Life in the Universe 199-50-32 Life in the Universe 199-50-52 Ames Research Center Initiatives 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-32 BIOSYNTHESIS Bioseparation Processes 179-80-40 BLACK HOLES (ASTRONOMY) X-Ray Astronomy 188-46-59	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 velopment W83-70250 W83-70425 W83-70425 W83-70426 W83-70432 W83-70432 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438 W83-70437 W83-70439	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38 C-47 AIRCRAFT Flight Support 533-02-91 CALCIUM METABOLISM Bone Loss 199-20-31 CAUBRATING	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70196 W83-70353 W83-70358 W83-70358 W83-70561 W83-70561
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-11 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72 BIOASTRONAUTICS Medical Operations Longitudinal Studies 199-10-21 Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-31 Crew Health Maintenance 199-10-32 Systems Habitability Verification	W83-70264 taily Vegetated W83-70530 ments (DATE) enficationOEX W83-70225 W83-70225 W83-70210 W83-70408 W83-70412 W83-70412 W83-704130 W83-70423 W83-70354 W83-70407 W83-70408 W83-70409	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-22 Life in the Universe 199-50-32 Life in the Universe 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-32 BIOSYNTHESIS Bioseparation Processes 179-80-40 BLACK HOLES (ASTRONOMY) X-Ray Astronomy 188-46-59 BLOOD COAGULATION Blood Alterations (Influence of Space file	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 velopment W83-70250 W83-70425 W83-70425 W83-70426 W83-70432 W83-70432 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438 W83-70457 Parge Scale Change W83-70518 W83-70410 W83-70410 W83-70388	Advanced Extravehicular Systems (Space Suit 199-60-21) BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic-Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38 C-47 AIRCRAFT Flight Support 533-02-91 CALIBRATING Controls and Instrumentation 505-40-52	W83-70442 W83-70492 In Productivity W83-70341 ology W83-70151 W83-70467 W83-70278 W83-70196 W83-70353 W83-70358 W83-70358 W83-70561 W83-70561
BAROCLINIC INSTABILITY Studies of Dynamics of Atmospheric Flows 148-76-00 BARREN LAND Hydrothermal Ore System Detection in Par Mountainous Terrain 677-41-13 BAYS (STRUCTURAL UNITS) Oynamic Acoustic and Thermal Environ Experiment (Transportation Technology V Program) 506-63-39 BEARINGS Power Transfer Research 505-40-42 Variable Thrust OTV Propulsion Technology 506-60-42 BED REST Longitudinal Studies 199-10-22 Crew Health Maintenance 199-10-32 Cardiovascular Deconditioning (JSC) 199-20-61 Fluid and Electrolyte Changes 199-20-62 BENEFICIATION Refining of Nonterrestrial Materials 508-53-17 BERING SEA Polar Oceanography 161-40-00 BIOASSAY Bioprocessing Studies 179-13-72 BIOASTRONAUTICS Medical Operations Longitudinal Studies 199-10-21 Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-31 Crew Health Maintenance	W83-70264 tailly Vegetated W83-70530 ments (DATE) erificationOEX W83-70225 W83-70226 W83-70210 W83-70410 W83-70412 W83-70412 W83-70412 W83-70423 W83-70407 W83-70407 W83-70408 W83-70408 W83-70409 W83-70410	199-30-36 Organic Geochemistry 199-50-22 BIOINSTRUMENTATION Advanced Equipment Development 199-80-31 Long Duration Life Sciences Satellite F 199-80-42 BIOLOGICAL EFFECTS Tropospheric Air Quality - Technology Dev 146-20-10 Crew Health Maintenance 199-10-31 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 Mammalian Development Facility 199-80-62 BIOLOGICAL EVOLUTION Developmental Biology 199-40-22 Organic Geochemistry 199-50-32 Life in the Universe 199-50-32 Life in the Universe 199-50-32 Ames Research Center Initiatives 199-90-72 BIOMASS Land Use and Techniques for Monitoring La in Biomass 677-21-30 BIOMEDICAL DATA Medical Operations Longitudinal Studies 199-10-21 Crew Health Maintenance 199-10-32 BIOSYNTHESIS Bioseparation Processes 179-80-40 BLACK HOLES (ASTRONOMY) X-Ray Astronomy 188-46-59 BLOOD COAGULATION	W83-70431 W83-70450 W83-70450 Program Definition W83-70452 velopment W83-70250 W83-70425 W83-70425 W83-70426 W83-70432 W83-70432 W83-70438 W83-70438 W83-70438 W83-70438 W83-70438 W83-70457 Parge Scale Change W83-70518 W83-70410 W83-70410 W83-70388	Advanced Extravehicular Systems (Space Suit 199-60-21 BRIGHTNESS TEMPERATURE Cloud Properties from Satellite Radiances 672-20-09 BRILLOUIN EFFECT Lidar and Acoustics Applications to Ocea 161-30-05 BROADBAND Acoustic Optic & Submillimeter Device Techn 506-54-16 BROADCASTING Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 BROMINE COMPOUNDS Chemical Kinetics of the Upper Atmosphere 147-21-03 BUBBLE MEMORY DEVICES Data Systems Research and Technology 506-58-13 BUBBLES Glass Research 179-11-20 Spherical Shell Technology Study 179-20-57 BUCKLING Advanced Structural Analysis Methods 505-33-53 C C C BAND Satellite Communication Technology 310-20-38 C-47 AIRCRAFT Flight Support 533-02-91 CALCIUM METABOLISM Bone Loss 199-20-31 CAUBRATING Controls and Instrumentation	W83-70442 W83-70492 In Productivity W83-70341 lology W83-70151 W83-70466 W83-70467 W83-70278 W83-70196 W83-70358 W83-70358 W83-70029 W83-70561 W83-70113 W83-70416

	AP) Experiment	CERAMICS		High Speed Signal Processing Research	
Development 506-63-43	W83-70228	Research in Advanced Material Concept: 505-33-10	s for Aeronautics W83-70017	310-30 70 W83 CIRCULATION DISTRIBUTION	-70570
Space Calibration of Solar Cells		High Temperature Materials		Global Weather Experiment Data Processing and R	
542-03-20 Verification and Analysis of Satellite Derived	W83-70244 Products	505-33-12 High Temperature Engine Composites	W83-70018	146-64-00 W83 CLASSIFICATIONS	3-70253
146-71-00	W83-70257	505-33-32 CHANNELS (DATA TRANSMISSION)	W83-70024	FILE Flight ExperimentsAnalysis and Support	
Absolute Solar Flux and Variability 673-15-00	W83-70501	Network Systems Technology Developmen		542 03-14 W83 Land Cover Multisensor Analysis	-70243
Correlative Measurement Improvements 673-18-00	W/93 70E03	310-20-33 CHARGE COUPLED DEVICES	W83-70560		70514
Multispectral Linear Array for Remote Sensi	W83-70502 ng	Acousto-Optic & Submillimeter Device Tec		The matic Mapper Simulator Land Resources Stu Western Ecozones	udies in
677-27-01 Sounding Rockets Experiments (Astronomy)	W83-70520	506-54-16 Programmable Mask Technology	W83-70151		-70515
879-11-41	W83-70552	506-54-17	W83-70152	Remote Sensing Applications for Facility Site Select	non and
CALIFORNIA Regional Crustal Deformation		Ultraviolet Detector Development 188-41-24	W83-70379	Waste Disposal Impact Assessment 677 60-15 W83	70548
676-10-10	W83-70506	X-Ray Astronomy CCD Instrumentation De	evelopment	Use of Thematic Mapper Data for Electrical	Utility
Land Cover Multisensor Analysis 677-21-25	W83-70514	188-46-59 CHARGE TRANSFER	W83-70389	Transmission Corridor Analysis and Siting 677-60 19 W83	-70549
Oil and Gas Test Case Study		Cloud Physics 179-75-10	W83-70363	CLEAR AIR TURBULENCE	
677-41-16 Use of Thematic Mapper Data for E	W83-70532 lectrical Utility	CHARGED PARTICLES	W63-70303	B-57B Flight Investigation of Environmental Hazards 505-45-01 W83	s 3 70083
Transmission Corridor Analysis and Siting		Spacecraft Power Systems R & T 506-55-75	W83-70180	Clear Air Turbulence Studies Using Passive Mic	rowave
677-60-19 CAMERAS	W83 70549	Biological Effects of Particle Radiation		Radiometers 505 45-05 W83	70086
Infrared Imagery of Shuttle	W83-70222	199-20-72 Radiation Effects and Protection	W83-70425	CLIMATE	
506-63-35 CARBOHYDRATE METABOLISM	W83-70222	199-20-76	W83-70426		-70249
Muscle Alterations 199-20-41	W00 70410	CHEMICAL ANALYSIS Planetary Materials Analysis		Tropospheric Air Quality - Technology Development	3-70250
General biomedical Research	W83-70418	152-01-40	W83 70293	146 20-10 W83 Global Ecology	1-70250
199-20-92	W83-70428	CHEMICAL COMPOSITION Improvements in Neutral and Ion Mass Sp	ectrometry	199 30-31 W83	70430
CARBON DIOXIDE Food Requirements Production and Proces	sing for CELSS	157-04-80	W83-70326	Atmospheres and Climate Data Management 656-26-02 W83	3-70480
199-60-42	W83-70444	CHEMICAL EVOLUTION Chemical Evolution		Global Climate Model Development and Application	
CARBON DIOXIDE CONCENTRATION Systems Habitability Verification		199-50-12	W83-70434	672-30-00 W83 Climate Observations	3-70493
199-10-41	W83-70411	Organic Geochemistry	W02 70425	672 40-00 W83	70494
Advanced Life Support Systems 199-60-12	W83 70441	199-50-22 Origin and Evolution of Life	W83 70435	CLIMATOLOGY Climate Program Support	
CARBON DIOXIDE LASERS		199-50-32	W83-70436	672-50 00 W83	-70496
Tropospheric Wind Measurement Assessme 146-72-04	nt W83-70260	Life in the Universe 199-50-52	W83-70438	Climate Research Program Support 672 50-06 W83	3-70497
Planetary Instrument Development Prog		CHEMICAL FRACTIONATION		CLINICAL MEDICINE	
Astronomy 157-05-50	W83-70328	Organic Geochemistry - 199-50-22	W83-70435	Operational Laboratory Support 199-10-11 W83	70405
CARBON FIBERS		CHEMICAL PROPERTIES		CLOSED ECOLOGICAL SYSTEMS	
Fire Resistant Composites 505-33-31	W83-70023	Computational Flame Radiation Research 505-31-41	W83-70011	Advanced Life Support Systems 199-60-11 W83	-70440
CARBON MONOXIDE		Advanced Computational Concepts		Food Requirements Production and Processing for	CELSS
Global Tropospheric Modeling of Trace 1 176-10-00	Gas Distribution W83-70350	505-37-21 Planetary Materials Laboratory and Analyl	W83 70052 tical Studies	199-60-42 W83 Waste Management for CELSS	-70444
CARBON-CARBON COMPOSITES		152-02-40	W83-70294	199-60 52 W83	3-70445
Thermal Protection Systems for Earth-To-Or 506-53-33	bit STS W83-70137	CHEMICAL PROPULSION Chemical Propulsion R&T Interagency Sup	port	Systems Management Control and Ecological Consideration (CELSS)	erations
Advanced Carbon-Carbon Panels		506-60-10	W83-70205	199-60-62 W83	70446
506-53-37 Advanced Space Structures	W83-70138	Advanced Low Thrust Chemical Propi 506-60-25	W83-70209	CLOUD COVER Numerical Analysis of Remote Sensing Data	
506-53-43	W83-70140	Space Station Propulsion Requirements		146-66-01 W83	-70255
CARDIOGRAPHY Advanced Equipment Development		506-64-12 Orbital Transfer Vehicle Ground Operations	W83-70229 Study	Remote Sensing of Atmospheric Structure 154 40-80 W83	-70312
199-80-31	W83-70450	906-64-24	W83 70588	CLOUD PHYSICS	,,,,,,
CARDIOVASCULAR SYSTEM Crew Health Maintenance		CHEMICAL REACTIONS Refining of Nonterrestrial Materials		Cloud Physics 179-75-10 W83	-70363
199-10-32	W83-70410	506-53-17		Global Climate Model Development and Applications	
Cardiovascular Deconditioning (JSC)		Maria Administration Control	W83-70130		
	W83-70412	Upper Atmosphere Research - Measurements	W83-70130 Reaction Rate	672-30-00 W83	s -70493
199-20-11 Cardiovascular Deconditioning	W83-70412	Measurements 147-21-00	Reaction Rate W83-70277	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support	-70493
199-20-11 Cardiovascular Deconditioning 199-20-12	W83-70412 W83-70413	Measurements	Reaction Rate W83-70277	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 W83	-70493 -70243
199-20-11 Cardiovascular Deconditioning 199-20-12 CARCO SPACECRAFT Advanced Transportation Shuttle Derived	W83-70413 Vehicles (SDV)	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION	W83-70277 W83-70278	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight Experiments - Analysis and Support 542-03-14 W83 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS)	-70493 -70243 re and
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00	W83-70413	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03	W83-70277 W83-70278	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 W83 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83	-70493 -70243 re and :70259
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist	W83-70413 Vehicles (SDV) W83-70589	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS)	Reaction Rate W83-70277 W83-70278 stry W83-70127	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur 146-72-02 Advanced Microwave Sensing of Meteor Parameters	1-70493 1-70243 re and 1-70259 rological
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11	W83-70413 Vehicles (SDV) W83-70589	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11	Reaction Rate W83-70277 W83-70278 stry W83-70127 neral Signal and	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistu Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 W83	1-70243 re and 1-70259 ological
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources	W83-70413 Vehicles (SDV) W83-70589 ry W83-70127	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51	Reaction Rate W83-70277 W83-70278 stry W83-70127 neral Signal and	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 W83 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83	1-70243 re and 1-70259 ological
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42	W83-70413 Vehicles (SDV) W83-70589	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Detr	Reaction Rate W83-70277 W83-70278 Stry W83-70127 meral Signal and actors W83-70393	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistru Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 W83 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices	1-70243 re and 1-70259 rological 1-70261 History
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid	W83-70413 Vehicles (SDV) W83-70589 ry W83-70127 W83-70556	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measur Millimeter and Submillimeter Radiometry	Reaction Rate W83-70277 W83-70278 Stry W83-70127 neral Signal and actors W83-70393 ements Program	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support \$42-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 W83 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 W83 Remote Sensing of Atmospheric Structure	1-70493 1-70243 1-70259 1010gical 1-70261 History 170308
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CELUNGS (ARCHITECTURE)	W83-70413 Vehicles (SDV) W83-70589 ry W83-70127 W83-70556	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemics 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Neral Signal and actors W83-70393 Ements Program W83-70271	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83	1-70243 re and 1-70259 rological 1-70261 History 1-70308
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 506-45-15 CELESTIAL NAVIGATION	W83-70413 Vehicles (SDV) W83-70589 ry W83-70127 W83-70556 Mechanics/Fire	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher	Reaction Rate W83-70277 W83-70278 Stry W83-70127 meral Signal and actors W83-70393 mements Program W83-70271	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistru Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 W83 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development	1-70493 1-70243 1-70259 1010gical 1-70261 History 170308
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 506-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development	W83-70413 Vehicles (SDV) W83-70589 VW83-70127 W83-70556 Mechanics/Fire W83-70089	Measurements 147-21-00 Chermical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Deti 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM	Reaction Rate W83-70277 W83-70278 Stry W83-70127 neral Signal and actors W83-70393 ements Program W83-70271 W83-70278	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 W83 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development 157-04-80 W83 Cloud Properties from Satellite Radiances	1-70493 1-70243 1-70259 1-70261 1-70261 1-70308 1-70311
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modelling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology	W83-70413 Vehicles (SDV) W83-70589 VW83-70127 W83-70556 Mechanics/Fire W83-70089 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measuri Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace	Reaction Rate W83-70277 W83-70278 Stry W83-70127 meral Signal and actors W83-70393 mements Program W83-70271 W83-70278 Gas Distribution	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Remote Sensing of Atmospheric Structure 154-40-80 Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support	1-70493 1-70243 re and 1-70259 ological 1-70261 History 1-70308 1-70312 1-70312
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CELLINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63	W83-70413 Vehicles (SDV) W83-70589 VW83-70127 W83-70556 Mechanics/Fire W83-70089	Measurements 147-21-00 Chermical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Deti 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM	Reaction Rate W83-70277 W83-70278 Stry W83-70127 neral Signal and actors W83-70393 ements Program W83-70271 W83-70278	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development 157-04-80 W83 Cloud Properties from Satellite Radiances 672-20-09 W83 Climate Program Support 672-50-00 W83	1-70493 1-70243 re and 1-70259 re ological 1-70261 History 1-70308 1-70312 1-70312
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 506-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development	W83-70413 Vehicles (SDV) W83-70589 VW83-70127 W83-70556 Mechanics/Fire W83-70089 W83-70557 W83-70559	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Ineral Program W83-70271 W83-70271 W83-70278 Gas Distribution W83-70350 Cean Productivity	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development 157-04-80 W83 Cloud Properties from Satellite Radiances 672-20-09 W83 Climate Program Support 672-50-00 W83 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod	1-70493 1-70243 1-70259 10logical 1-70261 1-70308 1-70311 1-70312 1-70312 1-70492 1-70496
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS	W83-70413 Vehicles (SDV) W83-70589 VW83-70127 W83-70556 Mechanics/Fire W83-70089 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05	Reaction Rate W83-70277 W83-70278 Stry W83-70127 meral Signal and actors W83-70393 mements Program W83-70271 E W83-70278 Gas Distribution W83-70350	672-30-00 W83 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support \$42-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 W83 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development 157-04-80 W83 Cloud Properties from Satellite Radiances 672-20-09 W83 Cloud Properties from Satellite Radiances 672-50-00 W83 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod	1-70493 1-70243 re and 1-70259 relations 1-70261 History 1-70308 1-70312 1-70312 1-70325 1-70496
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CELLINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLIS (BIOLOGY) Bioprocessing Studies	W83-70413 Vehicles (SDV) W83-70589 V W83-70556 Mechanics/Fire W83-70089 W83-70557 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROPORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Choronite Test Case Study	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Ineral Program W83-70271 W83-70271 W83-70278 Gas Distribution W83-70350 Cean Productivity W83-70341	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Mostau Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Was Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 0Cean Optics	1-70243 re and 1-70259 rological 1-70261 History 1-70308 1-70312 1-70312 1-70325 1-70492 1-70496 ductivity 1-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modelling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELESTIAL REFERENCE SYSTEMS	W83-70413 Vehicles (SDV) W83-70589 VW83-70127 W83-70556 Mechanics/Fire W83-70089 W83-70557 W83-70559	Measurements 147-21-00 Chermical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Deti 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17	Reaction Rate W83-70277 W83-70278 Stry W83-70127 neral Signal and actors W83-70393 ements Program W83-70271 e W83-70271 e W83-70278 Gas Distribution W83-70350 cean Productivity W83-70341 W83-70533	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Mostau Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Was Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 0Cean Optics	1-70493 1-70243 1-70259 10logical 1-70261 1-70308 1-70311 1-70312 1-70312 1-70492 1-70496
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Avation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72	W83-70413 Vehicles (SDV) W83-70589 V W83-70556 Mechanics/Fire W83-70089 W83-70557 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types	Reaction Rate W83-70277 W83-70278 Stry W83-70127 M83-70393 M83-70271 W83-70271 W83-70278 Gas Distribution W83-70350 cean Productivity W83-7033 at Discrimination	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research Advanced Moisturemperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Under Program Support 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL WATER Ocean Optics 161-30-00 COASTAL ZONE COLOR SCANNER Ocean Applications Development Program	1-70493 1-70243 1-70259 1-70261 1-70261 1-170308 1-70312 1-70312 1-70325 1-70496 1-70496 1-70496 1-70496
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 506-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation	W83-70413 Vehicles (SDV) W83-70589 IV W83-70556 Mechanics/Fire W83-70557 W83-70557 W83-70557 W83-70557	Measurements 147-21-00 Chermical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROPORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types	Reaction Rate W83-70277 W83-70278 Stry W83-70127 neral Signal and actors W83-70393 ements Program W83-70271 e W83-70271 e W83-70278 Gas Distribution W83-70350 cean Productivity W83-70341 W83-70533	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research Advanced Moistui Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Unfared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL WATER Ocean Optics 161-30-00 COASTAL ZONE COLOR SCANNER Ocean Applications Development	1-70493 1-70243 1-70259 1-70261 1-70261 1-70312 1-70312 1-70325 1-70492 1-70496 1-70341 1-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01	W83-70413 Vehicles (SDV) W83-70589 IV W83-70556 Mechanics/Fire W83-70557 W83-70557 W83-70557 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHOMITES Chomite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Ineral Program W83-70271 W83-70271 W83-70278 Gas Distribution W83-70341 W83-70533 ald Discrimination W83-70537	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 W83 Cloud Properties from Satellite Radiances 672-20-09 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-00 COASTAL WATER Ocean Applications Development 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 W83	1-70493 1-70243 1-70259 1-70261 1-70261 1-70312 1-70312 1-70325 1-70492 1-70496 1-70341 1-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 506-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRAL APROCESSING UNITS	W83-70413 Vehicles (SDV) W83-70589 W83-70556 Mechanics/Fire W83-70589 W83-70557 W83-70557 W83-70557 W83-70557 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLS Lidar and Acoustics Applications to O 161-30-05 CHOROPHYLS Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and	Reaction Rate W83-70277 W83-70278 Stry W83-70127 meral Signal and actors W83-70393 aments Program W83-70271 E W83-70278 Gas Distribution W83-70350 cean Productivity W83-70341 W83-70341 W83-70533 cal Discrimination W83-70537 Theoretical Solar	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL ZONE COLOR SCANNER Ocean Applications Development Program 161-30-01 W83 COASTAL ZONE COLOR SCANNER Ocean Applications Development Program 161-30-01 W83 COASTAL SONE COLOR SCANNER Ocean Applications Development Program 161-30-01 W83 COASTAL SONE COLOR SCANNER Ocean Applications to Ocean Prod 161-30-05 W83	1-70243 1-70243 1-70259 1-70261 1-70261 1-70311 1-70312 1-70325 1-70492 1-70340 1-70339
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modelling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRAL PROCESSING UNITS Global Weather Experiment Data Processin 146-64-00	W83-70413 Vehicles (SDV) W83-70589 W83-70556 Mechanics/Fire W83-70589 W83-70557 W83-70557 W83-70557 W83-70557 W83-70557	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMSPHERE Experiment Development - Laboratory and Physics 188-38-53	Reaction Rate	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 W83 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 W83 Remote Sensing of Atmospheric Structure 154-40-80 W83 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL VATER Ocean Applications Development Program 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL 2ONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COATING Electrically Conductive Thermal Control Coatings S06-53-26 W83	1-70243 1-70243 1-70259 1-70261 1-70261 1-70311 1-70312 1-70325 1-70492 1-70340 1-70339
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRAL PROCESSING UNITS Global Weather Experiment Data Processin	W83-70413 Vehicles (SDV) W83-70589 IV W83-70556 Mechanics/Fire W83-70689 W83-70557 W83-70557 W83-70557 W83-70557 W83-70545 gand Research	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measuri Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHOMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and Physics 188-38-53 Advanced Mission Study - Solar X-Ray Pinl Long Focal Length Coronagraph	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Ements Program W83-70271 W83-70271 W83-70278 Gas Distribution W83-70350 cean Productivity W83-70341 W83-70537 Theoretical Solar W83-70376 note Satellite and	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Mostau Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 181-30-05 COASTAL VATER Ocean Applications Development Program 161-30-01 COASTAL ZONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL SOURCE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL SOURCE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTING Electrically Conductive Thermal Control Coatings 506-53-26 COCKPIT SIMULATORS	1-70243 re and 70259 olological 7-70261 History 7-70361 History 7-70362 7-70312 7-70325 7-70492 7-70341 7-70341 7-70341 7-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 506-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLIS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRAL PROCESSING UNITS Global Weather Experiment Data Processin 146-64-00 CENTRIFUGAL COMPRESSORS Fan and Compressor Research 505-40-12	W83-70413 Vehicles (SDV) W83-70589 IV W83-70556 Mechanics/Fire W83-70689 W83-70557 W83-70557 W83-70557 W83-70557 W83-70545 gand Research	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Deti 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and Physics 188-38-53 Advanced Mission Study - Solar X-Ray Pint Long Focal Length Coronagraph 188-78-38	Reaction Rate	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 181-30-05 COASTAL WATER Ocean Optics 161-30-00 COASTAL ZONE COLOR SCANNER Ocean Applications Development Program 181-30-01 Lidar and Acoustics Applications to Ocean Prod 181-30-05 COASTAL CONE COLOR SCANNER Ocean Applications Development Program 181-30-01 Lidar and Acoustics Applications to Ocean Prod 181-30-05 COASTAL SONE COLOR SCANNER Ocean Applications Development Program 181-30-05 COASTAL CONE COLOR SCANNER Ocean Applications Development Program 181-30-05 COASTAL SONE COLOR SCANNER Ocean Applications Development Program 181-30-05 COASTAL SONE COLOR SCANNER Ocean Applications Development Program 181-30-05 COASTAL SONE COLOR SCANNER Ocean Applications to Ocean Prod 183 COCKPIT SIMULATORS Human Factors Facilities Operations 505-35-01 W83	1-70243 re and 70259 olological 7-70261 History 7-70361 History 7-70362 7-70312 7-70325 7-70492 7-70341 7-70341 7-70341 7-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modelling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELIS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRAL PROCESSING UNITS Global Weather Experiment Data Processin 146-64-00 CENTRIFUGAL COMPRESSORS Fan and Compressor Research	W83-70413 Vehicles (SDV) W83-70589 W83-70556 Mechanics/Fire W83-70557 W83-70557 W83-70557 W83-70557 W83-70554 W83-70425 W83-70545 g and Research W83-70253	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measuri Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and Physics 188-38-53 Advanced Mission Study - Solar X-Ray Pinl Long Focal Length Coronagraph 188-78-38 CIRCADIAN RHYTHMS Flight Management Systems	Reaction Rate W83-70277 W83-70278 Stry W83-70127 M83-70391 M83-70271 W83-70271 W83-70271 W83-70271 W83-70278 Gas Distribution W83-70350 Cean Productivity W83-70341 W83-70537 Theoretical Solar W83-70376 mole Satellite and W83-70391	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 W83 Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL VATER Ocean Optics 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL ZONE COLOR SCANNER Ocean Applications Development Program 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL CONE COLOR SCANNER Ocean Applications Development Program 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL SONE COLOR SCANNER Ocean Applications Development Program 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL SONE COLOR SCANNER Ocean Applications to Ocean Prod 161-30-05 COASTAL SONE COLOR SCANNER OCEAN APPLICATIONS Human Factors Facilities Operations 505-35-01 CODING Future Data Systems Concepts	1-70493 1-70243 1-70243 1-70259 1-70261 1-70261 1-70308 1-70312 1-70312 1-70312 1-70325 1-70496 1-70496 1-70497 1-70341 1-70339 1-70340 1-70341 1-70341 1-70341 1-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRIFUGAL COMPRESSORS Fan and Compressor Research 505-40-12 CENTRIFUGAL VGRF) Vestibular Research Facility (VRF)/Variable C	W83-70413 Vehicles (SDV) W83-70589 W83-70556 Mechanics/Fire W83-7059 W83-70557 W83-70557 W83-70557 W83-70545 W83-70425 W83-70545 g and Research W83-70253 W83-70266 iravity Research	Measurements 147-21-00 Chermical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROPHYLIS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and Physics 188-38-53 Advanced Mission Study - Solar X-Ray Pint Long Focal Length Coronagraph 188-78-38 CIRCADIAN ANYTHMS Flight Management Systems 505-35-21	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Ements Program W83-70271 W83-70271 W83-70278 Gas Distribution W83-70350 cean Productivity W83-70341 W83-70537 Theoretical Solar W83-70376 note Satellite and	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Mostum Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Remote Sensing of Atmospheric Structure 154-40-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 181-30-05 COASTAL WATER Ocean Optics 161-30-00 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL SCANNER Ocean Applications Development Program 161-30-05 COASTAL SCANNER OCEAN	1-70493 1-70243 1-70259 1-70261 1-70261 1-70312 1-70312 1-70312 1-70325 1-70492 1-70341 1-70339 1-70340 1-70341 1-70339
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Avation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 300-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELLS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRAL PROCESSING UNITS Global Weather Experiment Data Processin 146-64-00 CENTRIFUGAL COMPRESSORS Fan and Compressor Research 505-40-12 CENTRIFUGAE Vestibular Research Facility (VRF)/Variable CENTRIFUGING	W83-70413 Vehicles (SDV) W83-70589 W83-70556 Mechanics/Fire W83-70557 W83-70557 W83-70557 W83-70557 W83-70554 W83-70425 W83-70545 g and Research W83-70253	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHORINE Stratospheric Research Field Measuri Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLLS Lidar and Acoustics Applications to O 161-30-05 CHROMITES Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and Physics 188-38-53 Advanced Mission Study - Solar X-Ray Pinl Long Focal Length Coronagraph 188-78-38 CIRCADIAN RHYTHMS Flight Management Systems	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Imments Program W83-70271 W83-70271 W83-70271 W83-70350 Ineral Signal and actors W83-70350 Ineral Signal and actors W83-70371 W83-70360 W83-70537 Theoretical Solar W83-70376 Inole Satellite and W83-70391 W83-70038	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Mostum Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 181-30-05 COASTAL WATER Ocean Optics 161-30-00 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-00 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL ONE COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL SCANNER OCEAN ACCURATION OCEAN PROGRAM OC	1-70243 1-70243 1-70243 1-70259 1-70261 1-70361 1-70311 1-70312 1-70325 1-70492 1-70496 1-70496 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341
199-20-11 Cardiovascular Deconditioning 199-20-12 CARGO SPACECRAFT Advanced Transportation Shuttle Derived 906-65-00 CATALYSIS Surface Physics and Computational Chemist 506-53-11 CAVITIES Precision Time and Frequency Sources 310-10-42 CEILINGS (ARCHITECTURE) Aviation Safety Technology - Applied Fluid Materials Modeling 505-45-15 CELESTIAL NAVIGATION Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 CELESTIAL REFERENCE SYSTEMS Radio Metric Technology Development 310-10-60 CELIS (BIOLOGY) Bioprocessing Studies 179-13-72 Biological Effects of Particle Radiation 199-20-72 CENTRAL AMERICA ER SEASAT Digital SAR Processing 677-48-01 CENTRIFUGAL COMPRESSORS Fan and Compressor Research 505-40-12 CENTRIFUGAL CENTRIFUGAL CENTRIFUGAS Vestibular Research Facility (VRF)/Variable Centrify (SRF)	W83-70413 Vehicles (SDV) W83-70589 IV W83-70556 Mechanics/Fire W83-70089 W83-70557 W83-70557 W83-70557 W83-70545 W83-70425 W83-70425 W83-70425 W83-70545 g and Research W83-70253 W83-7056 iravity Research	Measurements 147-21-00 Chemical Kinetics of the Upper Atmospher 147-21-03 CHEMISORPTION Surface Physics and Computational Chemis 506-53-11 CHIPS (ELECTRONICS) Advanced Technological Development Ge Data Processing Electronics Solid State Dete 188-78-51 CHLORINE Stratospheric Research Field Measure Millimeter and Submillimeter Radiometry 147-12-06 CHLORINE OXIDES Chemical Kinetics of the Upper Atmospher 147-21-03 CHLOROFORM Global Tropospheric Modeling of Trace 176-10-00 CHLOROPHYLS Lidar and Acoustics Applications to O 161-30-05 CHOROPHYLS Chromite Test Case Study 677-41-17 Remote Sensing Techniques for Geobotanic of Chromium-Bearing Rock Types 677-42-05 CHROMOSPHERE Experiment Development - Laboratory and Physics 188-38-53 Advanced Mission Study - Solar X-Ray Pinl Long Focal Length Coronagraph 188-78-38 CIRCADIAN RHYTHMS Flight Management Systems 505-35-21 CIRCUITS	Reaction Rate W83-70277 W83-70278 Stry W83-70127 Ineral Signal and actors W83-70393 Imments Program W83-70271 W83-70271 W83-70271 W83-70350 Ineral Signal and actors W83-70350 Ineral Signal and actors W83-70371 W83-70360 W83-70537 Theoretical Solar W83-70376 Inole Satellite and W83-70391 W83-70038	672-30-00 CLOUDS (METEOROLOGY) FILE Flight ExperimentsAnalysis and Support 542-03-14 Global Weather Research - Advanced Moistur Temperature Sounder (AMTS) 146-72-02 Advanced Microwave Sensing of Meteor Parameters 146-72-05 Planetary Atmospheric Composition Structure and 154-10-80 Planetary Clouds Particulates and Ices 154-30-80 Remote Sensing of Atmospheric Structure 154-40-80 Infrared Experiment Development 157-04-80 Cloud Properties from Satellite Radiances 672-20-09 Climate Program Support 672-50-00 COASTAL ECOLOGY Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL WATER Ocean Optics 161-30-01 Lidar and Acoustics Applications to Ocean Prod 161-30-05 COASTAL SOUR COLOR SCANNER Ocean Applications Development Program 161-30-05 COASTAL ONE COLOR SCANNER Ocean Applications Development Tolical and Acoustics Applications to Ocean Prod 161-30-05 COASTAL SUBJECTION W83 COASTAL WATER OCEAN APPLICATIONS Human Factors Facilities Operations 506-53-26 COCKPIT SIMULATORS Human Factors Facilities Operations 506-35-01 W83 Advanced Space Systems for Users of NASA NASA	1-70243 1-70243 1-70243 1-70259 1-70261 1-70361 1-70311 1-70312 1-70325 1-70492 1-70496 1-70496 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341 1-70341

COGNITIVE PSYCHOLOGY		Network Systems Technology Development	t	Aircraft Controls Theory and Applications	
Teleoperator Human Interface Technology 506-57-25	W83-70191	310-20-33	W83-70560	505-34-03 Inlets and Nozzles	W83-70032
COHERENT ELECTROMAGNETIC RADIATION	ON	Satellite Communication Technology 310-20-38	W83-70561	505-40-02	W83-70055
Advanced Infrared Astronomy and Laborat	tory Astrophysics W83-70396	Advanced Space Systems for Users of 310-20-46	NASA Networks W83-70563	Automation Research and Technology for Nea Operations	ar-Earth Mission
COLOR CODING FILE Flight ExperimentsAnalysis and Supp	nort	COMMUNICATION SATELLITES		506-54-66 Spacecraft Controls and Guidance	W83-70163
542-03-14	W83-70243	Deep Space and Advanced COMSAT C Technology		506-57-13	W83-70185
COLORADO Hydrothermal Ore System Detection in Pa	rtially Vegetated	506-58-25 Spectrum and Orbit Utilization Studies	W83-70202	Advanced Large Spacecraft Systems Analysi 506-62-23	w83-70213
Mountainous Terrain 677-41-13	W83-70530	643-10-01	W83-70467	Network Software Design Technology 310-40-72	W83-70576
COMBUSTION	***************************************	New Application Studies 643-10-02	W83-70468	System Analysis and Evaluation of Perman	
Computational Flame Radiation Research 505-31-41	W83-70011	Communications Satellite New Applica Studies	ition Notification	Orbiting Space Facilities 906-54-20	W83-70579
Reduced Gravity Combustion Science 179-80-51	W83-70366	643-10-02	W83-70469	COMPUTER COMPATIBLE TAPES Digital Image Recovery and Data Manageme	ent
COMBUSTION CHAMBERS	***************************************	Propagation Studies and Measurements 643-10-03	W83-70470	656-31-02	W83-70482
Burning Fundamentals & Heat Transfer 505-31-42	W83-70012	Experiment Coordination and Mission Supp 646-41-01	ort W83-70471	COMPUTER DESIGN Flight Simulation Technology	
Combustors and Turbines 505-40-22	W83-70057	Satellite Switching and Processing Systems	s	505-35-33 COMPUTER GRAPHICS	W83-70041
Turbine Engine Hot Section Technology (Hi	OST)	650-60-21 RF Components for Satellite Communication		Mathematics for Engineering and Science	
533-04-12 Reusable High Pressure Main Engine Techr	W83-70115 nology	650-60-22 Advanced Communications Technology S	W83-70476 Satellite (ACTS)	505-31-83 Piloted Simulation Technology	W83-70016
506-60-19 COMBUSTION PHYSICS	W83-70208	System Studies 650-60-26	W83-70478	505-35-31 Aircraft Fuel Efficiency Improvement	W83-70040
Computational Flame Radiation Research	14/02 70044	Geostationary Platform Bus Definition		505-45-22	W83-70091
505-31-41 Burning Fundamentals & Heat Transfer	W83-70011	906-90-03 COMMUNITIES	W83-70595	Teleoperator Human Interface Technology 506-57-25	W83-70191
505-31-42 Aviation Safety Technology - Applied Fluid	W83-70012	Community Response to Noise 505-35-13	W83-70037	Transportable Applications Executive (TAE) 656-44-10	W83-70486
Materials Modeling	·	COMPILERS	***************************************	Planetary Data Network Project 656-80-01	W83-70489
505-45-15 Reduced Gravity Combustion Science	W83-70089	MPP - Systems Software R & T 506-54-56	W83-70159	General Ground Support Equipment (G	
179-80-51 COMBUSTION PRODUCTS	W83-70366	COMPONENT RELIABILITY Power Transfer Research		Technology Extension 656-90-01	W83-70491
Propulsion Instrumentation	W83-70014	505-40-42	W83-70059	IPL Upgrade Interactive Display/Virtual Ro 677-80-22	
505-31-52 COMET HEADS	W63-70014	COMPOSITE MATERIALS Research in Advanced Material Concepts	for Aeronautics	COMPUTER NETWORKS	
Comets 196-41-75	W83-70401	505-33-10 Rotorcraft Airframe Systems	W83-70017	Numerical Aerodynamic Computational Tech 505-37-01	niques W83-70049
COMET NUCLEI Extended Atmospheres		505-42-23	W83-70065	Data Systems Research and Technology 506-58-13	W83-70196
154-80-80	W83-70317	Operational Problems Fireworthiness and 505-45-11	W83-70088	Data Systems Research and Technology	
Giotto particulate Impact Analyzer (PIA) Support) Co-Investigator	Structural Integration 534-03-13	W83-70116	506-58-15 Mass Storage Network R&D	W83-70197
156-03-04 Comets	W83-70322	Effects of Space Environment on Composite		656-42-01 Advanced Technology Global Resources Net	W83-70483
196-41-75	W83-70401	506-53-25 Hypervelocity Impact Resistance of Com	posite Materials	656-44-06	W83-70485
COMET TAILS Giotto Dust Impact Detection System (DID	SY)	506-53-27 COMPOSITE STRUCTURES	W83-70134	Transportable Applications Executive (TAE) 656-44-10	W83-70486
156-03-07 Ground-Based Observations of the Sun	W83-70323	Advanced Structural Analysis Methods	W83-70029	Improved On-Line Availability of Data 656-50-01	W83-70487
188-38-52	W83-70374	505-33-53 Highly Maneuverable Aircraft Technology	Flight Research	Planetary Data Network Project	
Comets 196-41-75	W83-70401	533-03-11 COMPRESSOR EFFICIENCY	W83-70114	656-80-01 Sciences Directorate Local Area Computer N	W83-70489 letwork
COMETARY ATMOSPHERES Imaging Studies of Comets		Fan and Compressor Research 505-40-12	W83-70056	656-85-01 Network Monitor and Control Technology	W83-70490
196-41-52	W83-70395	COMPRESSORS		310-30-69	W83-70569
COMETS Cross Section Determination Cosmic		Advanced Thermal Control Technology Propellant Storage	for Croyogenic	Mission Operations Technology 310-40-45	W83-70573
Background Determination Neutron Transport Planetary Evaluation and Dynamic Studies	t Calculation and	506-64-25 COMPTON EFFECT	W83-70235	COMPUTER PROGRAMMING MPP - Systems Software R & T	
	W83-70301			506-54-56	W83-70159
153-03-50		Gamma Ray Astronomy			***************************************
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80	w83-70315	188-46-57 COMPUTATION	W83-70386	Software Technology 310-10-23	W83-70554
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma-	w83-70315	188-46-57 COMPUTATION Mathematics for Engineering and Science		Software Technology 310-10-23 Network Software Design Technology	W83-70554
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50	W83-70315 Ray Methods for W83-70324	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts	W83-70016	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS	W83-70554 W83-70576
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80	W83-70315 Ray Methods for W83-70324	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21		Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application	W83-70554 W83-70576 ons in Fluid
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31	W83-70016	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01	W83-70554 W83-70576 ons in Fluid W83-70001
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32	W83-70016 W83-70052	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02	W83-70554 W83-70576 ons in Fluid W83-70001
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 cory Astrophysics	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat	W83-70016 W83-70052 W83-70053 W83-70054	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21	W83-70554 W83-70576 ons in Fluid W83-70001 hinery
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 ory Astrophysics W83-70396	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS	W83-70016 W83-70052 W83-70053 W83-70054	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomact 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 cory Astrophysics	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma	W83-70016 W83-70052 W83-70053 W83-70054 ions in Fluid W83-70001	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 ory Astrophysics W83-70396	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamics	W83-70016 W83-70052 W83-70053 W83-70054 Ions in Fluid W83-70001 chinery W83-70002	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRILAB Operations	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-77 Chemical Evolution 199-50-12	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 tory Astrophysics W83-70396 W83-70400	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02	W83-70016 W83-70052 W83-70053 W83-70054 Hons in Fluid W83-70001 Hothinery W83-70002	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-23 Numerical Aerodynamic Computational Technology	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hingues
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 W83-70396 W83-70400 W83-70403	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Flows 505-31-11	W83-70016 W83-70052 W83-70053 W83-70054 Ions in Fluid W83-70001 chinery W83-70002	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-23 Numerical Aerodynamic Computational Techn 505-37-01	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-12 Solar System Environments	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 tory Astrophysics W83-70400 W83-70403 W83-70403	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13	W83-70016 W83-70053 W83-70054 Hons in Fluid W83-70001 chinery W83-70002 es W83-70003 W83-70004 W83-70005	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hingues
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Ne	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 tory Astrophysics W83-70400 W83-70403 W83-70403 W83-70434 W83-70437 ear-Earth Mission	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control	W83-70016 W83-70053 W83-70054 Hons in Fluid W83-70001 chinery W83-70002 es W83-70003 W83-70004 W83-70005	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-23 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-32	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 niques W83-70049
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Ne	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 tory Astrophysics W83-70400 W83-70403 W83-70403	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynami 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-11 Experimental/Theoretical Aerodynamics	W83-70016 W83-70052 W83-70053 W83-70054 HIGH STATE OF THE O	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-12 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-32 Inlets and Nozzles	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70007 W83-70016 W83-70032 W83-70035 niques W83-70052 W83-70052
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-12 COMMAND AND CONTROL Automation Research and Technology for Ne Operations 506-54-66 Mission Operations Technology 310-40-45	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 tory Astrophysics W83-70400 W83-70403 W83-70403 W83-70434 W83-70437 ear-Earth Mission	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-13 Viscous Plows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21 Experimental/Applied Aerodynamics	W83-70016 W83-70052 W83-70053 W83-70054 Hons in Fluid W83-70001 chinery W83-70002 cs W83-70003 W83-70004 W83-70006 W83-70006	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70007 W83-70016 W83-70032 W83-70035 miques W83-70054 W83-70054
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Net Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 tory Astrophysics W83-70400 W83-70403 W83-70403 W83-70404 W83-70405	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities ComPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynami 505-31-10 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21	W83-70016 W83-70052 W83-70053 W83-70054 Hons in Fluid W83-70001 Chinery W83-70002 CS W83-70003 W83-70004 W83-70006 W83-70007 W83-70008	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-21 Autoriat Controls Theory and Applications 505-34-03 AIRIAB Operations 505-34-03 Numerical Aerodynamic Computational Technology 505-37-21 Computational Facilities 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tell	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hiques W83-70052 W83-70052 W83-70054 W83-70055 W83-70144
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spa 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Ne Operations 506-54-66 Mission Operations Technology 310-40-45	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 W83-70396 W83-70400 W83-70403 W83-70434 W83-70437 ear-Earth Mission W83-70163 W83-70573 chinology W83-70200	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynami 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-23 Mathematics for Engineering and Science	W83-70016 W83-70052 W83-70053 W83-70054 Hons in Fluid W83-70001 chinery W83-70002 cs W83-70003 W83-70004 W83-70006 W83-70006	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-10 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-23 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hiques W83-70052 W83-70052 W83-70054 W83-70055 W83-70144
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Nei Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Technology S System Studies	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 OVASTOOPHORE W83-70400 W83-70403 W83-70434 W83-70437	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-11 Viscous Plows 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-12 Mathematics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-31-81	W83-70016 W83-70052 W83-70054 W83-70001 W83-70002 W83-70003 W83-70004 W83-70006 W83-70006 W83-70006 W83-70006 W83-70006 W83-70006 W83-70006	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-23 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Technology-37-21 Computational Facilities 505-37-21 Computational Facilities 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tel- Robotics 506-54-65 OEX-Advanced Autopilot	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70007 W83-70016 W83-70032 W83-70035 hinery W83-70054 W83-70055 W83-70055 W83-70144 eoperation and W83-70162
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spe 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Net Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec 506-58-22 Advanced Communications Technology S System Studies 650-60-26 COMMUNICATION NETWORKS	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 W83-70396 W83-70400 W83-70403 W83-70434 W83-70437 ear-Earth Mission W83-70163 W83-70573 chinology W83-70200	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational Fluid Dynamics for Turboma 505-31-10 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-23 Mathematics for Engineering and Science 505-31-183 Aeronautics Graduate Research Program	W83-70016 W83-70052 W83-70054 W83-70001 W83-70002 W83-70003 W83-70004 W83-70006 W83-70006 W83-70006 W83-70006 W83-70006 W83-70006 W83-70006	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tell Robotics 506-64-65 0EX-Advanced Autopilot 506-63-42 Teleoperator and Robotics System Analysis	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70016 W83-70032 W83-70035 miques W83-70052 W83-70054 W83-70055 W83-70144 eoperation and W83-70162 W83-70162
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Net Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec 506-58-22 Advanced Communications Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 OVASTOOPHORE W83-70400 W83-70403 W83-70434 W83-70437	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynami 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/ Theoretical Aerodynamics 505-31-21 Experimental/ Applied Aerodynamics 505-31-23 Mathematics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Teci 505-37-01 Advanced Computational Concepts	W83-70016 W83-70052 W83-70054 W83-70001 w83-70002 cs W83-70003 W83-70005 W83-70006 W83-70006 W83-70007 W83-70008 W83-70008 W83-70008 W83-70008	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-10 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-23 Numerical Aerodynamic Computational Technology 505-37-01 Advanced Computational Concepts 505-37-01 Computational Facilities 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tel- Robotics 506-54-65 CEX-Advanced Autopilot 506-63-42	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70007 W83-70016 W83-70032 W83-70035 hittory W83-70054 W83-70054 W83-70055 W83-70144 eoperation and W83-70162
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Nei Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec 506-58-22 Advanced Communications Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27 Applications Experiments Program Support	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 ory Astrophysics W83-70400 W83-70403 W83-70404 W83-70437 ear-Earth Mission W83-70163 W83-70573 chinology W83-70200 atellite (A CTS) W83-70478	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational Fluid Dynamics for Turboma 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-23 Mathematics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Teci 505-37-01 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support	W83-70016 W83-70052 W83-70054 W83-70001 W83-70002 W83-70003 W83-70004 W83-70006 W83-70006 W83-70008 W83-70008 W83-70008 W83-70045 hniques W83-70049 W83-70052	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-1 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-22 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tel Robotics 506-54-65 CEX-Advanced Autopilot 506-63-42 Teleoperator and Robotics System Analysis 506-64-23 Giotto Ephemeris Support 156-03-02	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hitques W83-70054 W83-70055 W83-70055 W83-70164 eoperation and W83-70162 W83-70162 W83-70227 W83-70234 W83-70320
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Nei Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 OVER METHOD	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational Fluid Dynamics for Turboma 505-31-10 Viscous Plows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-15 Experimental/Applied Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-183 Aeronautics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Tec 505-37-01 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31	W83-70016 W83-70052 W83-70053 W83-70001 chinery W83-70002 cs W83-70003 W83-70006 W83-70006 W83-70006 W83-70008 W83-70008 W83-70008 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Technology 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tel- Robotics 506-63-42 Teleoperator and Robotics System Analysis 506-64-23 Giotto Ephemeris Support 156-03-02 General Ground Support Equipment (G	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70016 W83-70032 W83-70035 migues W83-70055 W83-70054 W83-70055 W83-70144 eoperation and W83-70162 W83-70227 W83-70234 W83-70234 W83-70320 SE) Software
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Ne Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec 506-58-22 Advanced Communications Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Communications Laboratory for Transpond	w83-70315 Ray Methods for w83-70324 ectrometry w83-70326 w83-70329 w83-70395 w83-70396 w83-70400 w83-70403 w83-70403 w83-70403 w83-70403 w83-70407 sear-Earth Mission w83-70163 w83-70573 echnology w83-70200 atellite (A CTS) w83-70204 w83-70204 w83-70204	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-13 Boundary-Layer Stability and Transition Res 505-31-12 Experimental/Applied Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Teci 505-37-21 Class VI Computational Capability Support 505-37-31 Computational and Experimental Aerotheror 505-37-31	W83-70016 W83-70052 W83-70054 W83-70054 W83-70001 W83-70002 CS W83-70003 W83-70005 W83-70006 W83-70006 W83-70007 W83-70006 W83-70006 W83-70006 W83-70009 W83-70045 hniques W83-70049 W83-70052 W83-70053	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-23 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-32 Inlets and Nozzles 505-37-32 Inlets and Nozzles 505-36-0.02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tele Robotics 506-53-42 Teleoperator and Robotics System Analysis 506-64-23 Giotto Ephemeris Support 156-03-02 General Ground Support Equipment (G	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hiques W83-70054 W83-70055 W83-70054 W83-70055 W83-70162 W83-70162 W83-70162 W83-70227 W83-70234 W83-70320 SE) Software W83-70491
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Net Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec 506-58-22 Advanced Communications Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 ory Astrophysics W83-70400 W83-70403 W83-70404 W83-70437 ear-Earth Mission W83-70573 echnology W83-70200 astellite (A CTS) W83-70204 W83-70204 W83-70204 W83-70472 W83-70473 der Development	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-12 Mathematics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Tecl 505-37-21 Class VI Computational Capability Support 505-37-31 Computational and Experimental Aerotheroc 505-31-11 Entry Vehicle Aerothermodynamics	W83-70016 W83-70052 W83-70053 W83-70001 chinery W83-70002 cs W83-70003 W83-70006 W83-70006 W83-70006 W83-70008 W83-70008 W83-70008 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-22 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tel Robotics 506-54-65 OEX-Advanced Autopilot 506-63-42 Teleoperator and Robotics System Analysis 506-64-23 Grotto Ephemeris Support 156-03-02 General Ground Support Equipment (G Technology Extension 656-90-01 IPL Upgrade Interactive Display/Virtual Rot 677-80-22	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70032 W83-70035 hiques W83-70054 W83-70055 W83-70054 W83-70055 W83-70162 W83-70162 W83-70162 W83-70227 W83-70234 W83-70320 SE) Software W83-70491
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-12 COMMAND AND CONTROL Automation Research and Technology for Nei Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Communications Laboratory for Transpond and Satellite Network Evaluation 650-60-02 Advanced Communications Technology	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 ON Astrophysics W83-70400 W83-70400 W83-70403 W83-70403 W83-70403 W83-70403 W83-70408 W83-70473 Chnology W83-70573 Chnology W83-70478 W83-70478 W83-70478 W83-70478 W83-70473 der Development W83-70477	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-02 Computational and Analytical Fluid Dynamic 505-31-13 Viscous Plows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-15 Experimental/Applied Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Tec 505-37-01 Advanced Computational Concepts 505-37-31 Computational and Experimental Aerotheror 506-51-11 Entry Vehicle Aerothermodynamics 506-51-13 COMPUTER AIDED DESIGN Computational Methods and Applicat	W83-70016 W83-70052 W83-70054 W83-70054 W83-70001 W83-70002 CS W83-70003 W83-70006 W83-70006 W83-70006 W83-70007 W83-70006 W83-70016 W83-70045 hniques W83-70045 hniques W83-70053 dynamics W83-70123 W83-70124	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-83 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-03 Numerical Aerodynamic Computational Techn 505-37-01 Advanced Computational Concepts 505-37-21 Computational Facilities 505-37-32 Inlets and Nozzles 505-40-02 Space Vehicle Dynamics Methodology 506-53-55 Automation Technology for Planning Tell Robotics 506-54-65 0EX-Advanced Autopilot 506-63-42 Teleoperator and Robotics System Analysis 506-64-23 Giotot Ephemeris Support 156-03-02 General Ground Support Equipment (G Technology Extension 656-90-01 IPL Upgrade Interactive Display/Virtual Ros 677-80-22 Software Technology 310-10-23	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70035 hingues W83-70052 W83-70054 W83-70055 W83-70054 W83-70144 experation and W83-70162 W83-70237 W83-70234 W83-70320 SE) Software W83-70491
153-03-50 Cosmic Chemistry Aeronomy Comets Gra 154-75-80 X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration 157-03-50 Improvements in Neutral and Ion Mass Spot 157-04-80 Planetary Instrument Definition 157-20-70 Imaging Studies of Comets 196-41-52 Advanced Infrared Astronomy and Laborat 196-41-54 Radio Astronomy 196-41-73 Planetary Infrared Imaging 196-41-77 Chemical Evolution 199-50-12 Solar System Environments 199-50-42 COMMAND AND CONTROL Automation Research and Technology for Ne Operations 506-54-66 Mission Operations Technology 310-40-45 COMMUNICATION EQUIPMENT Satellite Communications Research and Tec 506-58-22 Advanced Communications Technology S System Studies 650-60-26 COMMUNICATION NETWORKS Space Station Communication Technology 506-58-27 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Communications Laboratory for Transpond and Satellite Network Evaluation 650-60-23	W83-70315 Ray Methods for W83-70324 ectrometry W83-70326 W83-70329 W83-70395 ON Astrophysics W83-70400 W83-70400 W83-70403 W83-70403 W83-70403 W83-70403 W83-70408 W83-70473 Chnology W83-70573 Chnology W83-70478 W83-70478 W83-70478 W83-70478 W83-70473 der Development W83-70477	188-46-57 COMPUTATION Mathematics for Engineering and Science 505-31-83 Advanced Computational Concepts 505-37-21 Class VI Computational Capability Support 505-37-31 Computational Facilities 505-37-32 COMPUTATIONAL FLUID DYNAMICS Computational Methods and Applicat Dynamics 505-31-01 Computational Fluid Dynamics for Turboma 505-31-10 Computational Fluid Dynamics for Turboma 505-31-10 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Boundary-Layer Stability and Transition Res 505-31-15 Experimental/Theoretical Aerodynamics 505-31-21 Experimental/Applied Aerodynamics 505-31-23 Mathematics for Engineering and Science 505-31-83 Aeronautics Graduate Research Program 505-36-21 Numerical Aerodynamic Computational Teci 505-37-01 Advanced Computational Capability Support 505-37-31 Class VI Computational Capability Support 505-37-31 Computational and Experimental Aerotheroc 506-51-11 Entry Vehicle Aerothermodynamics 506-51-11	W83-70016 W83-70052 W83-70054 W83-70054 W83-70001 W83-70002 CS W83-70003 W83-70006 W83-70006 W83-70006 W83-70007 W83-70006 W83-70006 W83-70045 hniques W83-70049 W83-70053 dynamics W83-70123 W83-70124	Software Technology 310-10-23 Network Software Design Technology 310-40-72 COMPUTER PROGRAMS Computational Methods and Application Dynamics 505-31-01 Computational Fluid Dynamics for Turbomaci 505-31-02 Experimental/Theoretical Aerodynamics 505-31-21 Mathematics for Engineering and Science 505-31-21 Mathematics for Engineering and Science 505-31-23 Aircraft Controls Theory and Applications 505-34-03 AIRLAB Operations 505-34-23 Numerical Aerodynamic Computational Techi 505-37-21 Computational Facilities 505-37-22 Inlets and Nozzles 505-37-32 Inlets and Nozzles 505-35-55 Automation Technology for Planning Tel- Robotics 506-64-65 OEX-Advanced Autopilot 506-63-42 Teleoperator and Robotics System Analysis 506-64-23 Giotto Ephemeris Support 156-03-02 General Ground Support Equipment (G Technology Extension 56-90-01 IPL Upgrade Interactive Display/Virtual Ros 677-80-22 Software Technology	W83-70554 W83-70576 ons in Fluid W83-70001 hinery W83-70002 W83-70007 W83-70016 W83-70035 W83-70049 W83-70055 W83-70055 W83-70144 eoperation and W83-70162 W83-70227 W83-70234 W83-70234 W83-70320 SE) Software W83-70491

SUBJECT INDEX				COST ESTIMATES
Network Monitor and Control Technology		AIRLAB Operations		COOLING
310-30-69	W83-70569	505-34-23 Human Factors Facilities Operations	W83-70035	Non-Axisymmetric Nozzle Research 505-43-22 W83-70072
Human-to-Machine Interface Technology 310-40-37	W83-70572	505-35-01	W83-70036	Variable Thrust QTV Propulsion Technology
Mission Operations Technology	TOE 70	Aerospace Computer Science University 5 505-37-20	Research W83-70051	506-60-42 W83-70210
310-40-45 Network Software Design Technology	W83-70573	Class VI Computational Capability Support	1	COOLING SYSTEMS Combustors and Turbines
310-40-72	W83-70576	505-37-31 Computational Facilities	W83-70053	505-40-22 W83-70057
COMPUTER STORAGE DEVICES Archival Mass Memory		505-37-32	W83-70054	Earth-to-Orbit Propulsion Life and Performance Technology 506-60-12 W83-70206
506-58-10	W83-70194	Space Computer Science University Rese 506-54-50	w83-70158	Advanced Manned Vehicle Onboard Propulsion Technology
On-line Data Ingest/Staging System 506-58-19	W83-70199	Mission Operations Technology 310-40-45	W83-70573	506-60-17 W83-70207 Reusable High Pressure Main Engine Technology
Improved On-Line Availability of Data		COMSAT PROGRAM		506-60-19 W83-70208
656-50-01 COMPUTER SYSTEMS DESIGN	W83-70487	Deep Space and Advanced COMSAT Technology	「 Communications	COORDINATION Chemical Propulsion R&T Interagency Support
Numerical Aerodynamic Computational Tec	hniques	506-58-25	W83-70202	506-60-10 W83-70205
505-37-01 Advanced Computational Concepts	W83-70049	CONCENTRATORS Sounding Rocket Experiments (High En	ergy Astrophysics)	COPPER Acvive and Passive Sensor Research
505-37-21	W83-70052	879-11-46 CONDENSING	W83-70553	506-54-25 W83-70155
Class VI Computational Capability Support 505-37-31	W83-70053	Formation Evolution and Stability of		COPPER ALLOYS Experimental Magnetism
Automation Systems Research 506-54-63	W83-70161	153-01-60 Cosmic Chemistry Aeronomy Comets G	W83-70298 rains	153-08-50 W83-70305
Automations Technology for Manned Space	e Systems	154-75-80	W83-70315	CORNER FLOW Viscous Drag Reduction and Control
506-54-67 Oceanic Pilot System	W83-70164	CONDUCTIVE HEAT TRANSFER Structure and evolution of Solar Magnetic	Fields (Laboratory	505-31-13 W83-70005
656-13-40	W83-70479	& Theory for Solar Physics) 188-38-53	W83-70375	CORONAGRAPHS Advanced Mission Study - Solar X-Ray Pinhole Satellite and
Sciences Directorate Local Area Computer 656-85-01	W83-70490	CONICAL BODIES	1100-70075	Long Focal Length Coronagraph 188-78-38 W83-70391
Attitude/Orbit Technology 310-10-26	W83-70555	Detailed Aerothermal Loads 506-51-23	W83-70125	Planetary Infrared Imaging
Network Monitor and Control Technology		CONSTANTS		196-41-77 W83-70403
310-30-69 Operations Support Computing Technology	W83-70569	Data Survey and Evaluation 147-51-02	W83-70291	Data Analysis 385-38-01 W83-70459
310-40-26	W83-70571	CONSULTING Interagency and Industrial Assistance and	I Tantona	CORRELATORS
COMPUTER SYSTEMS PROGRAMS Transportable Applications Executive (TAE)		505-43-33	W83-70076	High-Speed Signal Processing Research 310-30-70 W83-70570
656-44-10 COMPUTER SYSTEMS SIMULATION	W83-70486	CONSUMABLES (SPACECREW SUPPLIES Advanced Life Support Systems	3)	CORROSION High Temperature Materials
MPP - Systems Software R & T		199-60-11	W83-70440	505-33-12 W83-70018
506-54-56 Advanced Concepts for Knowledge-Based	W83-70159 Expert Systems	Food Requirements Production and Pro 199-60-42	W83-70444	Surface Physics and Computational Chemistry 506-53-11 W83-70127
506-54-61	W83-70160	Waste Management for CELSS 199-60-52	W83-70445	COS-B SATELLITE
Communications Laboratory for Transport and Satellite Network Evaluation	der Development	Systems Management Control and Ecolog		Research in Astrophysics at the Goddard Institute for Space Studies and Columbia University
650-60-23 Computer Techniques	W83-70477	for CELSS 199-60-62	W83-70446	405-02-02 W83-70465 COSMIC BACKGROUND EXPLORER SATELLITE
Computational Fluid Dynamics for Turboma	achinery	CONTAINERLESS MELTS		Gravitational Wave Astronomy and Cosmology
505-31-02 Computational and Analytical Fluid Dynam	W83-70002	Multimode Acoustic Research 179-15-20	W83-70355	188-41-22 W83-70378 COSMIC DUST
505-31-03	W83-70003	Advanced Containerless Processing Techi 179-20-55	nology W83-70356	Planetary Materials Analysis
Experimental/Theoretical Aerodynamics 505-31-21	W83-70007	Electrostatic Containerless Processing Ter	chnology	Planetary Materials Laboratory and Analytical Studies
Mathematics for Engineering and Science 505-31-83	W83-70016	179-20-56 Spherical Shell Technology Study	W83-70357	152-02-40 W83-70294 Curation of Extraterrestrial Samples
Engine Dynamics and Aeroelasticity		179-20-57	W83-70358	152-04-40 W83-70296
505-33-42 Flight Control Concepts and Reliability Enh	W83-70027	Research of the use of Space Resources 179-46-20	W83-70361	COSMIC RAYS Cross Section Determination Cosmic Ray Induced
505-34-01	W83-70030	Containerless Processing 179-80-30	W83-70364	Background Determination Neutron Transport Calculation and
Advanced Controls and Guidance 505-34-11	W83-70033	Solidification Processes		Planetary Evaluation and Dynamic Studies 153-03-50 W83-70301
Computer-Aided Design	W83-70050	179-80-60 CONTAMINANTS	W83-70367	Particle Astrophysics and Experiment Definition Studies 188-46-56 W83-70383
505-37-13 Advanced Concepts for Knowledge-Based	Expert Systems	Advanced Life Support Systems		Gamma Ray Astronomy and Related Research
506-54-61 Coupled Active-Passive Sea Ice Analysis	W83-70160	199-60-12 CONTROL BOARDS	W83-70441	188-46-57 W83-70384 X-Ray Astronomy CCD Instrumentation Development
161-40-02	W83-70343	Manned Control of Remote Operations 506-57-23	W83-70190	188-46-59 W83-70389
COMPUTER VISION Advanced Concepts for Knowledge-Based	Expert Systems	CONTROL EQUIPMENT		Developmental Biology 199-40-22 W83-70432
506-54-61	W83-70160	Human Factors for Crew Interfaces in Sp. 506-57-27	ace W83-70192	High Energy Astrophysics Data Analysis 385-46-01 W83-70464
Automation Technology for Planning Tel Robotics		CONTROL SURFACES		COSMOCHEMISTRY
506-54-65 COMPUTERIZED SIMULATION	W83-70162	High-Speed Aerodynamics and Propulsion 505-43 23	n Integration W83-70073	Chemical Evolution 199-50-12 W83-70434
Computational Methods and Applicat	tions in Fluid	CONTROL THEORY Flight Control Concepts and Reliability En	h	COSMOLOGY
Dynamics 505-31-01	W83-70001	505-34-01	W83-70030	Studies of the Distribution of Elements and Mineral Phases Among Meteorites
Prioted Simulation Technology	W83-70040	Control Theory and Methodology 505-34 02	W83-70031	152-03-60 W83-70295 Gravitational Wave Astronomy and Cosmology
505-35-31 Flight Simulation Technology		Aircraft Controls Theory and Application	ıs	188-41-22 W83-70378
505-35-33 Numerical Aerodynamic Computational Tec	W83-70041	505-34-03 Advanced Controls and Guidance	W83-70032	Theoretical Studies of Galaxies Active Galactic Nuclei and Quasi Stellar Objects
505-37-01	W83-70049	505-34-11 OEX-Advanced Autopilot	W83-70033	188-41-53 W83-70381
Inlets and Nozzles 505-40-02	W83-70055	506-63-42	W83-70227	Life in the Universe 199-50-52 W83-70438
Controls and Instrumentation	W83-70060	CONTROL VALVES Electric Propulsion Thruster Subsystem R	&T	COST ANALYSIS Flight Simulation Technology
505-40-52 Aerodynamics/Propulsion Integration		506-55-25	W83-70169	505-35-33 W83-70041
505-45-43 Propulsive-Lift Technology - QSRA Flight E	W83-70093	CONTROLLABILITY High Performance Aircraft Flight Dyna	amics and Flying	Technology Requirements for Advanced Space Transportation Systems
533-02-50	W83-70106	Qualities 505-43-11	W83-70070	506-63-23 W83-70216
Turbine Engine Hot Section Technology (Hi 533-04-12	W83-70115	CONTROLLED ATMOSPHERES		Technology Systems Analysis Across Disciplines for Permanently Orbiting Space Stations
Manned Control of Remote Operations 506-57-23	W83-70190	Life Support Systems Technology Develor 506-64-37	pment W83-70240	506-64-13 W83-70230 New Application Studies
OTV Propulsion Performance and Plume	Characterization	CONVECTION		643-10-02 W83-70468
506-60-49 Teleoperator and Robotics System Analysis	W83-70211	Cross Section Determination Cosmi Background Determination Neutron Transpo		Network Systems Technology Development 310-20-33 W83-70560
506-64-23	W83-70234	Planetary Evaluation and Dynamic Studies 153-03-50	W83-70301	Systems Management Technology
Global Weather Experiment Data Processii 146-64-00	W83-70253	Crystal Growth Research		Teleoperator Maneuvering System
General Circulation Modeling of the Stratos		179-80-70 Development of Experiments and Hardwai	W83-70369 re for Solar Physics	906-75-00 W83-70591 COST ESTIMATES
147-32-00 Giotto Ion Mass Spectrometer Co-Investiga	ator Support	Research		Space Station Propulsion Requirements
156-03-03 Origin and Evolution of Life	W83-70321	188-38-51 Lithospheric Structure and Evolution	W83-70370	506-64-12 W83-70229 Advanced Space Transportation Systems Ground
199-50-32	W83-70436	676-30-05	W83-70507	Operations
COMPUTERS Control Theory and Methodology		CONVECTIVE FLOW Studies of Dynamics of Atmospheric Flow		Advanced Transportation Shuttle Derived Vehicles (SDV)
505-34-02	W83-70031	146-76-00	W83-70264	906-65-00 W83-70589

COST REDUCTION		Teleoperations and Cryogenic Fluid Manag	gement W83-70238	Advanced Technology Global Resources I 656-44-06	Network W83-70485
Energy Efficient Engine Project 535-01-12	W83-70120	506-64-29 Advanced Transportation	W83-70236	Climate Program Support	
Space Station Communication Technology 506-58-27	W83-70204	906-63-00	W83-70583	672-50-00 DATA COMPRESSION	W83-70496
Automation of Space Transportation System	ıs	Ground Operations Associated with Demonstrations	Special Flight	Information Sciences Research and Development	
506-63-27 Spacecraft System Technology	W83-70217	906-64-23	W83-70587	656-30-01 DATA CONVERSION ROUTINES	W83-70481
506-64-15	W83-70231	CRYOGENIC WIND TUNNELS Experimental Test Techniques		Geopotential Research Mission (GRM) GR	AVSAT/MAGSAT
Research Mission Study - TOPEX 161-10-01	WE3-70333	505-31-53	W83-70015	Studies 676-59-10	W83-70509
Advanced Extravehicular Systems		CRYSTAL DEFECTS Crystal Growth Processes		DATA CORRELATION	
199-60-22 COSTS	W83-70443	179-80-70	W83-70368	Programmable Mask Technology 506-54-17	W83-70152
Research Airport Operation	W02 70110	Crystal Growth Research 179-80-70	W83-70369	Correlative Measurement Improvements	W83-70502
534-04-16 CRACK INITIATION	W83-70119	CRYSTAL GROWTH	***************************************	673-18-00 Data Links	VV63-70502
Life Predicton Fatigue Damage and Enviror in Metals and Composites	nmental Effects	Crystal Growth in Space 542-03-30	W83-70246	Communications TDRSS Follow-On/I 506-58-26	ntersatellite Links W83-70203
505-33-21	W83-70020	Cloud Physics		Network Systems Technology Developmen	nt
Life Prediction for Engine Materials 505-33-22	W83-70021	179-75-10 Crystal Growth Processes	W83-70363	310-20-33 DATA MANAGEMENT	W83-70560
Surface Physics and Computational Chemisti	ry	179-80-70	W83-70368	International Halley Watch	
506-53-11 CRACK PROPAGATION	W83-70127	Crystal Growth Research 179-80-70	W83-70369	156-02-02 Atmospheres and Climate Data Managemi	W83-70318 ent
Life Predicton Fatigue Damage and Environ	nmental Effects	CRYSTAL OSCILLATORS Development of Experiments and Hardware	for Color Dhysias	656-26-02	W83-70480
in Metals and Composites 505-33-21	W83-70020	Research		Information Sciences Research and Develo 656-30-01	opment W83-70481
Life Prediction for Engine Materials		188-38-51 CRYSTALLIZATION	W83-70370	Digital Image Recovery and Data Manager	ment W83-70482
505-33-22 Life Prediction for Structural Materials	W83-70021	Glass Research		656-31-02 Planetary Data Network Project	VVB3-70482
505-33-23 CRASHES	W83-70022	179-11-20 CULTIVATION	W83-70353	656-80-01 DATA PROCESSING	W83-70489
Advanced Structural Analysis Methods		Food Requirements Production and Proc		Loads and Aeroelasticity	
505-33-53 CRASHWORTHINESS	W83-70029	199-60-42 CULTURE TECHNIQUES	W83-70444	505-33-43	W83-70028
Operational Problems Fireworthiness and C	Crashworthiness	Bioprocessing Studies		Flight Experiments Support 532-07-11	W83-70099
505-45-11 CRATERS	W83-70088	179-13-72 CURING	W83-70354	Data Systems Research and Technology 506-58-13	W83-70196
Experimental Impact Cratering		Composites for Airframe Structures		Solar Array Flight Experiment (SAFE) Dyr	
153-08-40 CREEP PROPERTIES	W83-70304	505-33-33 Fundamentals of Mechanical Behavior	W83-70025 of Composite	Augmentation (Flights 1 and 2) 506-62-49	W83-70215
Life Prediction for Engine Materials		Matrices		Infrared Imagery of Shuttle	
505-33-22 CREW STATIONS	W83-70021	506-53-15 CURRENT DISTRIBUTION	W83-70129	506-63-35 FILE Flight ExperimentsAnalysis and Sup	W83-70222
Flight Management Systems		Structure and evolution of Solar Magnetic	Fields (Laboratory	542-03-14	W83-70243
505-35-21 Rotorcraft Systems Integration	W83-70038	& Theory for Solar Physics) 188-38-53	W83-70375	Global Weather Experiment Data Process 146-64-00	ing and Research W83-70253
532-06-11	W83-70096	CV-990 AIRCRAFT Global Weather Research - Microwave	Praesura Soundar	Meteorological Observing System Develop	
CROP CALENDARS Digital Mapping of Irrigated Cropland		146-72-01	W83-70258	146-70-00 VEGA Balloon Nephelometer Design	W83-70256
677-60-11 CROP IDENTIFICATION	W83-70547	CYCLIC LOADS Life Prediction for Engine Materials		157-04-80 Development of New Remote Data	W83-70327 a Interpretation
Use of Thematic Mapper Data for Eli	ectrical Utility	505-33-22	W83-70021	Techniques	
Transmission Corridor Analysis and Siting 677-60-19	W83-70549	CYCLONES Meteorological Satellite Data Research	and Applications	175-20-00 Solar Physics Data Analysis and Operation	W83-70347
CROP INVENTORIES		146-61-00	W83-70252	385-38-01	W83-70460
Thematic Mapper Simulator Land Resour Western Ecozones	rces Studies in	CYTOLOGY Bioprocessing Studies		Information Sciences Research and Develo 656-30-01	pment W83-70481
677-21-⊉6	W83-70515	179-13-72 Blood Alterations (Influence of Space flip	W83-70354	Mass Storage Network R&D	
CROSS CORRELATION Programmable Mask Technology		and Blood-Forming Tissues)	gnt on the Blood	656-42-01 SAR Data System Research and Developm	W83-70483 nent
506-54-17	W83-70152	199-20-51 Blood Alterations	W83-70420	656-44-03	W83-70484
CROSS FLOW Aviation Safety Technology - Applied Fluid I	Mechanics/Fire	199-20-52	W83-70421	Planetary Data Network Project 656-80-01	W83-70489
Materials Modeling 505-45-15	W83-70089	Biological Effects of Particle Radiation 199-20-72	W83-70425	General Ground Support Equipment Technology Extension	(GSE) Software
F-4C Spanwise Blowing Flight Investigations		105-20-72	1103-70425	656-90-01	W83-70491
533-02-31 CRUISING FLIGHT	W83-70103	D		Geopotential Research Mission (GRM) GRA Studies	AVSAT/MAGSAT
Experimental/Applied Aerodynamics		D		676-59-10	W83-70509
505-31-23 CRUSTAL FRACTURES	W83-70008	DAMAGE ASSESSMENT Life Prediction for Engine Materials		SMIRR Data Analysis 677-41-19	W83-70534
Regional Crustal Deformation		505-33-22	W83-70021	Use of TM for the Detection of Mineraliza	
676-10-10 CRYOGENIC COOLING	W83-70506	DATA ACQUISITION Controls and Instrumentation		Terrain Through Inference of Geobotanical Pa 677-42-04	rameters W83-70536
Sensor Research and Technology		505-40-52	W83-70060	SIR A Data Analysis	
506-54-26 Advanced Thermal Control Technology for	W83-70156 or Crovogenic	Flight Experiments Support 532-07-11	W83-70099	677-43-18 Digital Mapping of Irrigated Cropland	W83-70541
Propellant Storage	. •	OEX (Orbiter Experiments) Project Support		677-60-11	W83-70547
506-64-25 Ground-Based Infrared Astronomy	W83-70235	506-63-31 Shuttle Entry Air Data System (SEADS)	W83-70219	Space Systems and Navigation Technology 310-10-63	w83-70559
196-41-50	W83-70394	506-63-32	W83-70220	Systems Management Technology	W83-70575
Radio Systems Development 310-20-66	W83-70566	Dynamic Acoustic and Thermal Envir Experiment (Transportation Technology Vi		310-40-49 DATA REDUCTION	Wa3-70575
CRYOGENIC EQUIPMENT		Program)		High Resolution Accelerometer Package (Hi	RAP) Experiment
Acousto-Optic & Submillimeter Device Techn 506-54-16	W83-70151	506-63-39 High Resolution Accelerometer Package (H	W83-70225 RAP) Experiment	Development 506-63-43	W83-70228
Advanced Thermal Control Technology Propellant Storage	for Croyogenic	Development		Meteorological Satellite Data Research 146-60-00	W83-70251
506-64-25	W83-70235	506-63-43 International Halley Watch	W83-70228	Meteorological Satellite Data Research	and Applications
Planetary Instrument Development Progra	am/Planetary	156-02-02	W83-70318	146-61-00 Planetary Geology	W83-70252
Astronomy 157-05-50	W83-70328	DATA BASE MANAGEMENT SYSTEMS Computer-Aided Design		151-01-70	W83-70292
CRYOGENIC FLUID STORAGE		505-37-13	W83-70050	Remote Sensing 153-07-40	W83-70303
Advanced Space Structures 506-53-43	W83-70140	Atmospheres and Climate Data Manageme 656-26-02	W83-70480	Giotto Ion Mass Spectrometer Co-Investiga	ator Support
Advanced Thermal Control Technology		Digital Image Recovery and Data Manager 656-31-02	ment W83-70482	156-03-03 Giotto particulate Impact Analyzer (PIA	W83-70321
Propellant Storage 506-64-25	W83-70235	DATA BASES	1133-70402	Support	
CRYOGENIC FLUIDS		Mathematics for Engineering and Science 505-31-83	W83-70016	156-03-04	W83-70322
Platform Systems Operations 506-64-22	W83-70233	Human Factors for Crew Interfaces in Spain	ce	Coupled Active-Passive Sea Ice Analysis 161-40-02	W83-70343
In-Space Fluid Management Technology - Go		506-57-27	W83-70192	Ground-Based Observations of the Sun	
506-64-26		Archival Mass Memory			
Teleoperations and Cryogenic Fluid Managem	W83-70236	Archival Mass Memory 506-58-10	W83-70194	188-38-52	W83-70373
506-64-29	W83-70236		W83-70194 W83-70231		
506-64-29 CRYOGENIC ROCKET PROPELLANTS	W83-70236 nent W83-70238	506-58-10 Spacecraft System Technology 506-64-15 Assessment of Ozone Perturbations	W83-70231	188-38-52 Gravitational Wave Astronomy and Cosmol 188-41-22 Data Analysis Astronomy	logy W83-70378
506-64-29	W83-70236 nent W83-70238	506-58-10 Spacecraft System Technology 506-64-15		188-38-52 Gravitational Wave Astronomy and Cosmo 188-41-22	logy

SUBJECT INDEX					DRAG
Cloud Properties from Satellite Radiances		X-Band Uplink Development		High Performance Aircraft Flight Dynamics & Co	
672-20-09 GRAVSAT Study	W83-70492	310-20-64 Radio Systems Development	W83-70564	505-43-13 N	W83-70071
676-40-01	W83-70508	310-20-66 Communications Systems Technology Dev	W83-70566	196-41-73	W83-70400
Renewable Resources Field Research and Analysis		310-20-67	W83-70567	SAR Data System Research and Development 656-44-03	W83-70484
677-21-24 Land Cover Multisensor Analysis	W83-70513	Network Monitor and Control Technology 310-30-69	W83-70569	Satellite Communication Technology	
677-21-25 Remote Sensing Techniques for Geobotanic	W83-70514	High-Speed Signal Processing Research 310-30-70	W83-70570	DIGITAL TECHNIQUES	W83-70561
of Chromium-Bearing Rock Types		Network Software Design Technology		Submillimeter & Optical Processing Device Res 506-54-12	earch W83-70148
677-42-05 New Techniques for Quantitative Analysis	W83-70537 of SAR Images	310-40-72 DEFLECTION	W83-70576	Application of Digital Image Processing Tec	
677-46-02 Use of Thematic Mapper Data for 8	W83-70543	Flight Loads Analysis 505-33-41	W83-70026	Astronomical Imagery 385-41-01	W83-70462
Transmission Corridor Analysis and Siting		DEFLECTORS Powered Lift Propulsion Technology		Satellite Switching and Processing Systems	
677-60-19 DATA RETRIEVAL	W83-70549	505-43-02	W83-70069	650-60-21 Digital Image Recovery and Data Management	W83-70475
Data Analysis Astronomy 385-41-01	W83-70463	DEGRADATION Effects of Space Environment on Composi	tes		W83-70482
Information Sciences Research and Develop		506-53-25 DEMAGNETIZATION	W83-70132	656-60-10	W83-70488
DATA SAMPLING		Experimental Magnetism	14/00 70005	Digital • Topographic Mapping Requirements/Feasibility Study	Mission
Thematic Mapper Simulator Land Resour Western Ecozones	rces Studies in	153-08-50 DEMODULATION	W83-70305	677-29-12 Digital Topographic Mapping	W83-70522 Mission
677-21-26 DATA SMOOTHING	W83-70515	Satellite Switching and Processing System 650-60-21	ns W83-70475	Requirements/Feasibility Study	W83-70523
Crustal Magnetic Field Representation and		DENDRITIC CRYSTALS Solidification Processes		ER SEASAT Digital SAR Processing	
677-45-06 DATA STORAGE	W83-70542	179-80-60	W83-70367	677-48-01 Spatial Radar Image Registration	W83-70545
Solid State & Optical Device Research 506-54-13	W83-70149	DEPLOYMENT Study of Large Deployable Reflector	for Infrared and		W83-70546
Archival Mass Memory		Submillimeter Astronomy 506-62-21	W83-70212	677-60-11	W83-70547
506-58-10 Data Systems Research and Technology	W83-70194	Shuttle Operational Flight Test of a Large	Solar Array	DISCONTINUITY Solar and Heliospheric Physics Data Analyses	
506-58-13 On-line Data Ingest/Staging System	W83-70196	542-03-04 Tethered Satellite System (TSS) (Syst	W83-70242 em (Development)	385-38-01 DISCOS (SATELLITE ATTITUDE CONTROL)	W83-70461
506-58-19 SAR Data System Research and Developme	W83-70199	906-70-00 Deployable Antenna Flight Experiment	W83-70590	Payloads Definition Methods	400 30145
656-44-03	W83-70484	906-90-00	W83-70594	Geopotential Research Mission (GRM) GRAVSA	W83-70145 T/MAGSAT
Improved On-Line Availability of Data 656-50-01	W83-70487	DEPOLARIZATION Propagation Studies and Measurements		Studies 676-59-10	W83-70509
Advanced Technology Image Digitization 656-60-10	W83-70488	643-10-03 DEPTH MEASUREMENT	W83-70470	DISEASES Crew Health Maintenance	
Planetary Data Network Project		Long Wavelength Subsurface Sounder 677-29-23	W83-70528	199-10-31	W83-70409
656-80-01 Image Processing Technology	W83-70489	DESERTLINE		DISPLAY DEVICES Advanced Navigation Guidance and Controls	Technology
310-40-46 DATA SYSTEMS	W83-70574	Monitoring Large Scale Total Primary Desertification Processes with AVHRR Imag		505-34-13 Flight Management Systems	W83-70034
Space Computer Science University Research 506-54-50	ch W83-70158	199-30-07 DESERTS	W83-70429	505-35-21	W83-70038
Future Data Systems Concepts		Monitoring Large Scale Total Primary			w83-70039
506-58-11 Data Systems Research and Technology	W83-70195	Desertification Processes with AVHRR Imagi 199-30-07	ery W83-70429	Piloted Simulation Technology 505-35-31	W83-70040
506-58-13 Data Systems Research and Technology	W83-70196	DESIGN ANALYSIS Analysis and Design		Flight Simulation Technology	W83-70041
506-58-15	W83-70197	506-53-53 Technology Systems Analysis Across	W83-70143	Geodynamics/Flight Dynamics of Powered	Lift Vehicles
Data Systems Research and Technology 506-58-16	W83-70198	Permanently Orbiting Space Stations		505-43-01 Simulation Facilities Operations	W83-70068
On-line Data Ingest/Staging System 506-58-19	W83-70199	506-64-13 Platform Systems Study	W83-70230	532-08-11 Powered Lift Systems Technology - Harrier Flig	W83-70100 ht Research
Oceanic Pilot System 656-13-40	W83-70479	506-64-19 Advanced Equipment Development	W83-70232	Program	W83-70107
Atmospheres and Climate Data Managemer	nt	199-80-31 Large Primate Facility	W83-70450	Advanced Transport Operating Systems	
656-26-02 Information Sciences Research and Develop		199-80-52	W83-70454	534-04-13 Named Control of Remote Operations	W83-70118
656-30-01 Digital Image Recovery and Data Managem	W83-70481	Software Technology 310-10-23	W83-70554	506-57-23 Number 1 Number 1 Number 1 Number 2 Nu	W83-70190
656-31-02 Mass Storage Network R&D	W83-70482	Network Monitor and Control Technology 310-30-69	W83-70569		W83-70192
656-42-01	W83-70483	Network Software Design Technology 310-40-72		Spatial Radar Image Registration	
Advanced Technology Global Resources Ne 656-44-06	etwork W83-70485	DETECTION	W83-70576	677-48-03 NOTE: 677-48-03 NOTE	W83-70546
Transportable Applications Executive (TAE) 656-44-10	W83-70486	Aviation Safety Severe Storm Hazards 505-45-03	W83-70085	Spacecraft Controls and Guidance	W83-70185
Improved On-Line Availability of Data		DIAGNOSIS Crew Health Maintenance		Advanced Control Technology	
656-50-01 Planetary Data Network Project	W83-70487	199-10-31	W83-70409	DISTRIBUTING	W83-70186
656-80-01 Human-to-Machine Interface Technology	W83-70489	Power Systems Management and Distribution	tion	Multi 100 kW Low Cost Earth Orbital Systems 508-55-79	W83-70183
310-40-37 Systems Management Technology	W83-70572	506-55-72 Advanced Power System Technology	W83-70179	DIURNAL VARIATIONS Upper Atmosphere Research - Field Measureme	
310-40-49	W83-70575	506-55-76 DIETS	W83-70181	147-12-00	W83-70269
DATA TRANSMISSION Correlative Measurement Improvements		General biomedical Research		Column-Content	ofile and
673-18-00 Satellite Communication Technology	W83-70502	199-20-92 DIFFERENTIAL EQUATIONS	W83-70428		W83-70498
310-20-38	W83-70561	Mathematics for Engineering and Science 505-31-83	W83-70016	Experiment Coordination and Mission Support	
DECISION MAKING Automation Technology for Planning Te	leoperation and	DIFFERENTIAL INTERFEROMETRY	***************************************	DOPPLER EFFECT	W83-70471
Robotics 506-54-65	W83-70162	Radio Metric Technology Development 310-10-60	W83-70557	Gas Correlation Wind Sensor 147-18-02	W83-70275
Systems Management Technology 310-40-49	W83-70575	DIFFERENTIATION (BIOLOGY) Developmental Biology		Advanced Earth Orbiter Radio Metric	Technology
DECODING	W03-70373	199-40-22	W83-70432		V83-70334
High-Speed Signal Processing Research 310-30-70	W83-70570	DIFFRACTION PROPAGATION Electronics Research and Technology		Gravitational Wave Astronomy and Cosmology 188-41-22	W83-70378
DECOUPLING Decoupler Pylon Flight Evaluation		506-54-15	W83-70150	Geopotential Research Mission (GRM) GRAVSA Studies	
533-02-71	W83-70109	Digital Data Digital Image Recovery and Data Manager		676-59 10 V	N83-70509
Decoupler Pylon Flight Demonstration 533-02-73	W83-70110	656-31-02 Land Cover Multisensor Analysis	W83-70482	DOPPLER RADAR Aviation Safety Severe Storm Hazards	
DEEP SPACE NETWORK Deep Space and Advanced COMSAT Co	mmunications	677-21-25	W83-70514		W83-70085
Technology 506-58-25	W83-70202	Use of Thematic Mapper Data for Transmission Corridor Analysis and Siting	Electrical Utility	146-72 04 V	W83-70260
Radio Metric Technology Development		677-60-19	W83-70549	DOWNLINKING Communications Laboratory for Transponder D	Pevelopment
310-10-60 Frequency and Timing Research	w83-70557	Advanced Controls and Guidance		and Satellite Network Evaluation 650-60-23	N83-70477
310-10-62 Space Systems and Navigation Technology	W83-70558	505-34-11 Advanced Navigation Guidance and Col	W83-70033	DRAG Advanced Concepts	
310-10-63	W83-70559	505-34 13	W83-70034		V83-70593

DRAG REDUCTION SUBJECT INDEX

DRAG REDUCTION Viscous Drag Reduction and Control		Atmospheres and Climate Data Management 656-26-02 W83-70480	ELECTRIC FIELDS Electrostatic Containerless Processing Technology
505-31-13	W83-70005	EARTH CRUST	179-20-56 W83-70357
Supersonic Aerodynamics Configuration Structures & Materials Technology	ns Integration	Early Crustal Genesis 153-09-40 W83-70306	ELECTRIC GENERATORS Advanced Concepts in Energy Conversion
505-43-43 DRAINAGE PATTERNS	W83-70078	Regional Crustal Deformation	506-55-12 W83-70165 Advanced Radiant Energy Conversion
Hydrologic Information Extraction Technique		676-10-10 W83-70506 Crustal Magnetic Field Representation and Verification	506-55-13 W83-70166
677-22-27 DRONE AIRCRAFT	W83-70519	677-45-06 W83-70542	Technology of Advanced Concepts 506-55-15 W83-70167
Loads and Aeroelasticity		EARTH HYDROSPHERE Global Ecology	ELECTRIC POWER TRANSMISSION
505-33-43 DROP TOWERS	W83-70028	199-30-31 W83-70430	Advanced Concepts in Energy Conversion 506-55-12 W83-70165
Spherical Shell Technology Study		EARTH MANTLE	Technology of Advanced Concepts
179-20-57 Containerless Processing	W83-70358	JPL Petrology Support 153-02-70 W83-70300	506-55-15 W83-70167 ELECTRIC PROPULSION
179-80-30 DROPS (LIQUIDS)	W83-70364	EARTH MOVEMENTS	Electric Propulsion Technology 506-55-22 W83-70168
Development of a Shuttle Flight Experiment	Drop Dynamics	Regional Crustal Deformation 676-10-10 W83-70506	Space Station Propulsion Requirements
Module 542-03-01	W83-70241	SERIES - Satellite Emission Range Inferred Earth Surveying	506-64-12 W83-70229 ELECTRIC ROCKET ENGINES
DRUGS	W63-70241	676-59-30 W83-70510 EARTH OBSERVATIONS (FROM SPACE)	Electric Propulsion Thruster Subsystem R&T
Bioseparation Processes 179-80-40	W83-70365	Ocean Advanced Studies	506-55-25 W83-70169 ELECTRICAL INSULATION
DURABILITY		161-10-00 W83-70332 Research Mission Study - TOPEX	Advanced Power System Technology
Turbine Engine Hot Section Technology (HO: 533-04-12	ST) W83-70115	161-10-01 W83-70333	506-55-76 W83-70181 ELECTRICAL RESISTIVITY
Structural Integration		Space Station Resource Observations Payload Study 677-29-14 W83-70524	Electrically Conductive Thermal Control Coatings
534-03-13 Space Durable Composites and Thermal C	W83-70116 Control Surfaces	Luminescence Detector from Space	506-53-26 W83-70133 ELECTRO-OPTICS
506-53-29	W83-70135	677-29-22 W83-70527	Controls and Instrumentation
Planetary Clouds Particulates and Ices		EARTH ORBITS Orbiting VLBI Feasibility Study	505-40-52 W83-70060 Submillimeter & Optical Processing Device Research
154-30-80 Extended Atmospheres	W83-70311	159-41-03 W83-70330	506-54-12 W83-70148
154-80-80	W83-70317	EARTH RADIATION BUDGET EXPERIMENT Solar Irradiance Rocket Experiment	High Resolution Laser Research 506-54-23 W83-70154
Giotto particulate Impact Analyzer (PIA) Co Support	o-Investigator	672-40-08 W83-70495	ELECTROCARDIOGRAPHY Longitudinal Studies
156-03-04	W83-70322	EARTH RESOURCES Advanced Technology Global Resources Network	199-10-22 W83-70408
Giotto Dust Impact Detection System (DIDS: 156-03-07	Y) W83-70323	656-44-06 W83-70485 Renewable Resources Field Research and Spacecraft Data	Crew Health Maintenance 199-10-32 W83-70410
Planetary Instrument Definition		Analysis	ELECTROCHEMISTRY
157-20-70 DYNAMIC CHARACTERISTICS	W83-70329	677-21-24 W83-70513 Thematic Mapper Simulator Land Resources Studies in	Advanced Electrochemical Systems 506-55-55 W83-70175
Tribological Experiments in Zero Gravity		Western Ecozones	Space Energy Conversion Support
542-03-27 Comets	W83-70245	677-21-26 W83-70515 Space Station Resource Observations Payload Study	506-55-70 W83-70178 Correlative Measurement Improvements
196-41-75	W83-70401	677-29-14 W83-70524	673-18-00 W83-70502
Solar Array Flight Experiment (SAFE) Dynar	mics & Control	ER SEASAT Digital SAR Processing 677-48-01 W83-70545	ELECTROCONDUCTIVITY Long Wavelength Subsurface Sounder
Augmentation (Flights 1 and 2)		Digital Mapping of Irrigated Cropland	677-29-23 W83-70528
506-62-49 DYNAMIC LOADS	W83-70215	677-60-11 W83-70547 Remote Sensing Applications for Facility Site Selection and	ELECTRODES Electrochemical Energy Conversion and Storage
Space Vehicle Dynamics Methodology 506-53-55	14/02 70144	Waste Disposal Impact Assessment	506-55-52 W83-70174
Space Vehicle Structural Dynamic Analysis	W83-70144 and Synthesis	677-60-15 W83-70548 IPL Upgrade Interactive Display/Virtual Roam	Advanced Electrochemical Systems 506-55-55 W83-70175
Methods 506-53-59		677-80-22 W83-70550	ELECTROLYSIS
Dynamic Acoustic and Thermal Environ	W83-70146 nments (DATE)	EARTH SURFACE Global Weather Research - Microwave Pressure Sounder	Electrochemical Energy Conversion and Storage 506-55-52 W83-70174
Experiment (Transportation Technology Veri		146-72-01 W83-70258	Orbital Energy Storage and Power Systems 506-55-57 W83-70176
Program) 506-63-39	W83-70225	Lithospheric Structure and Evolution 676-30-05 W83-70507	Research of the use of Space Resources
DYNAMIC MODELS Studies of Dynamics of Atmospheric Flows		EARTH TERMINALS	179-46-20 W83-70361 Advanced Life Support Systems
146-76-00	W83-70264	Space Communications Systems Antenna Technology 650-60-20 W83-70474	199-60-12 W83-70441
DYNAMIC RESPONSE Engine Dynamics and Aeroelasticity		Satellite Communication Technology 310-20-38 W83-70561	ELECTROLYTE METABOLISM Fluid and Electrolyte Change
505-33-42	W83-70027	EARTHQUAKES W65-70561	199-20-61 W83-70422
Space Vehicle Dynamics Methodology 506-53-55	W83-70144	Lithospheric Structure and Evolution 676-30-05 W83-70507	Fluid and Electrolyte Changes 199-20-62 W83-70423
Space Vehicle Structural Dynamic Analysis		ECHELETTE GRATINGS	ELECTROLYTES
Methods 506-53-59	W83-70146	Ground-Based Observations UV and Optical Astronomy 188-41-21 W83-70377	Fluid and Electrolyte Change 199-20-61 W83-70422
Advanced Control Technology		ECOLOGY	Fluid and Electrolyte Changes
506-57-15 Solar Array Flight Experiment (SAFE) Dynan	W83-70186 mics & Control	Lidar and Acoustics Applications to Ocean Productivity 161-30-05 W83-70341	199-20-62 W83-70423 ELECTROLYTIC CELLS
Augmentation (Flights 1 and 2)	W83-70215	Global Ecology	Orbital Energy Storage and Power Systems 506-55-57 W83-70176
506-62-49 Shuttle Operational Flight Test of a Large So		199-30-31 W83-70430 Biosphere-Atmosphere Interactions in Wetland Ecosystems	ELECTROMAGNETIC ABSORPTION
542-03-04 DYNAMIC STABILITY	W83-70242	199-30-36 W83-70431	Solar Flux in Upper Atmosphere 147-15-00 W83-70273
Advanced Space Structures Antenna	Technology	ECONOMIC ANALYSIS Technology Requirements for Advanced Space Transportation	ELECTROMAGNETIC FIELDS
Development 506-53-45	W83-70141	Systems 506-63-23 W83-70216	Containerless Processing 179-80-30 W83-70364
Advanced Concepts	**********	ECOSYSTEMS	ELECTROMAGNETIC SPECTRA
906-80-00	W83-70593	Biosphere-Atmosphere Interactions in Wetland Ecosystems 199-30-36 W83-70431	Meteorological Parameter Extraction 146-65-00 W83-70254
DYNAMIC STRUCTURAL ANALYSIS Analysis and Design		Food Requirements Production and Processing for CELSS	ELECTROMAGNETIC WAVE TRANSMISSION
506-53-53	W83-70143	199-60-42 W83-70444 Systems Management Control and Ecological Considerations	Solar Flux in Upper Atmosphere 147-15-00 W83-70273
Space Vehicle Dynamics Methodology 506-53-55	W83-70144	for CELSS	ELECTRON BEAMS
Space Vehicle Structural Dynamic Analysis		199-60-62 W83-70446 EFFICIENCY	Satellite Communications Research and Technology 506-58-22 W83-70200
Methods 506-53-59	W83-70146	Energy Efficient Engine Project	ELECTRON IMPACT
Shuttle Operational Flight Test of a Large Sol	lar Array	535-01-12 W83-70120 EIGENVALUES	Electronics Research and Technology 506-54-15 W83-70150
542-03-04	W83-70242	Boundary-Layer Stability and Transition Research	ELECTRON MICROSCOPY
DYNAMICS Advanced Space Structures		505-31-15 W83-70006 EJECTA	Planetary Materials Laboratory and Analytical Studies 152-02-40 W83-70294
506-53-43	W83-70140	Data Analysis	Planetary Instrument Definition
		385-38-01 W83-70459 ELECTRIC ARCS	157-20-70 W83-70329 ELECTRONIC CONTROL
E		Spacecraft Power Systems R & T	Control Theory and Methodology 505-34-02 W83-70031
		506-55-75 W83-70180 ELECTRIC CONDUCTORS	ELECTRONIC EQUIPMENT
EARTH ATMOSPHERE Planetary Aeronomy Theory and Analysis		Power Systems Management and Distribution	AIRLAB Operations 505-34-23 W83-70035
154-60-80	W83-70314	506-55-72 W83-70179 ELECTRIC ENERGY STORAGE	Radio Technical Commission for Aeronautics (RTCA)
Extended Atmospheres 154-80-80	W83-70316	Electrochemical Energy Conversion and Storage	534-04-10 W83-70117 ELECTRONS
Global Ecology	7700-70310	506-55-52 W83-70174 Orbital Energy Storage and Power Systems	Particle Astrophysics and Experiment Definition Studies
199-30-31	W83-70430	506-55-57 W83-70176	188-46-56 W83-70383

SUBJECT INDEX EXOBIOLOGY

SUBJECT INDEX				EXO	BIOLOGY
ELECTROPHORESIS		Advanced Turboprop-Installation Aerodynami		Life Support Systems Technology Developmen	
Electrostatic Containerless Processing Technol 179-20-56	ogy W83-70357	535-03-11 Advanced Turboprop Program	W83-70121	506-64-37 Systems Habitability Verification	W83-70240
ELECTROSTATIC PRECIPITATORS		535-03-12 ENGINE CONTROL	W83-70122	199-10-41	W83-70411
Refining of Nonterrestrial Materials 506-53-17	W83-70130	Control Theory and Methodology	W00 70001	ENVIRONMENTAL MONITORING Monitoring Large Scale Total Primary Pr	oduction and
ELECTROSTATICS Electrostatic Containerless Processing Technol	logy	505-34-02 ENGINE DESIGN	W83-70031	Desertification Processes with AVHRR Imagery 199-30-07	W83-70429
179-20-56	W83-70357	Engine Dynamics and Aeroelasticity 505-33-42	W83-70027	Advanced Technology Global Resources Netv	vork
EMBRYOLOGY Developmental Biology		Graduate Program in Aeronautics 505-36-22	W83-70046	656-44-06 Global Climate Model Development and Appli	W83 70485 cations
199-40-22	W83-70432	Fan and Compressor Research		672-30-00	W83-70493
Mammalian Development Facility 199-80-62	W83-70455	505-40-12 Engine Systems Research	W83-70056	Land Resources Applied Research 677-21-29	W83-70517
EMERGENCY LIFE SUSTAINING SYSTEMS Inflight Medical Support		505-40-62 Supersonic Propulsion Integration Technologi	W83-70061	Land Use and Techniques for Monitoring Large in Biomass	Scale Change
199-10-00	W83-70404	505-43-42	W83-70077	677-21-30	W83-70518
EMISSION SPECTRA Gas Correlation Wind Sensor		Convertible Engine System Technology 532-06-12	W83-70097	EPHEMERIDES Giotto Ephemeris Support	
147-18-02 Upper Atmosphere Research - Laboratory N	W83-70275 Measurements	Energy Efficient Engine Project 535-01-12	W83-70120	156-03-02 Asteroids	W83-70320
147-23-00	W83-70280	ENGINE FAILURE Fan and Compressor Research		196-41-76	W83-70402
Improved Rock Type Discrimination 677-41-03	W83-70529	505-40-12	W83-70056	EPOXY MATRIX COMPOSITES Effects of Space Environment on Composites	
Thermal Protection Systems for Earth-To-Orbit	t STS	Controls and Instrumentation 505-40-52	W83-70060	506-53-25 ERROR ANALYSIS	W83-70132
506-53-33 ENCAPSULATING	W83-70137	Engine Systems Research 505-40-62	W83-70061	Critical Examination of Upper Stratospheric I 147-43-00	Measurements W83-70288
High Performance Solar Array Research an		ENGINE INLETS Inlets and Nozzles		ERROR DETECTION CODES	
506-55-45 END-TO-END DATA SYSTEMS	W83-70172	505-40-02	W83-70055	Automations Technology for Manned Space S 506-54-67	wstems W83-70164
SAR Data System Research and Development 656-44-03	t W83-70484	Powered Lift Propulsion Technology 505-43-02	W83-70069	Data Systems Research and Technology 506-58-15	W83-70197
ENDOCRINOLOGY	70404	Supersonic Propulsion Integration Technolog 505-43-42	w83-70077	ERRORS	1103-70137
Bone Loss 199-20-31	W83-70416	ENGINE MONITORING INSTRUMENTS	W83-70077	Space Human Factors 506-57-21	W83-70189
ENERGETIC PARTICLES Particle Astrophysics and Experiment Defi	inition Studies	Propulsion Instrumentation 505-31-52	W83-70014	ERYTHROCYTES Blood Alterations (Influence of Space flight	on the Blood
188-46-56	W83-70383	Control Theory and Methodology 505-34-02	W83-70031	and Blood-Forming Tissues)	
Gamma Ray Astronomy 188-46-57	W83-70386	Controls and Instrumentation		199-20-51 Blood Alterations	W83-70420
Advanced Technological Development General Data Processing Electronics Solid State Detector		505-40-52 ENGINE NOISE	W83-70060	199-20-52 ESCAPE CAPSULES	W83-70421
188-78-51 ENERGY CONSERVATION	W83-70393	Aeroacoustics Research 505-31-33	W83-70010	Interagency Assistance and Testing - Dryden 505-43-31	W83 70074
Aircraft Fuel Efficiency Improvement		Energy Efficient Engine Project 535-01-12		ESTUARIES	W63 70074
505-45-22 Energy Efficient Engine Project	W83-70091	ENGINE PARTS	W83-70120	Ocean Optics 161-30-00	W83-70339
535-01-12 ENERGY CONVERSION	W83-70120	High Temperature Materials 505-33-12	W83-70018	ETIOLOGY Crew Health Maintenance	
Advanced Concepts in Energy Conversion	14/00 70405	Life Prediction for Engine Materials 505-33-22	W83-70021	199-10-31	W83-70409
506-55-12 Technology of Advanced Concepts	W83-70165	High Temperature Engine Composites		Space Motion Sickness 199-20-21	W83-70414
506-55-15 Orbital Energy Storage and Power Systems	W83-70167	505-33-32 Engine Dynamics and Aeroelasticity	W83-70024	Basic Mechanisms Underlying Space Motion : 199-20-22	Sickness W83-70415
506-55-57	W83-70176	505-33-42 Inlets and Nozzles	W83-70027	EUROPEAN SPACE PROGRAMS	***************************************
Photovoltaic Research and Technology		505-40-02	W83-70055	Giotto Ephemeris Support 156-03-02	W83-70320
506-55-42 Solar Cell Research	W83-70170	Fan and Compressor Research 505-40-12	W83-70056	Giotto Ion Mass Spectrometer Co-Investigator 156-03-03	Support W83-70321
506-55-43 ENERGY SPECTRA	W83-70171	Combustors and Turbines 505-40-22	W83-70057	Giotto Dust Impact Detection System (DIDSY 156-03-07	
Particle Astrophysics and Experiment Defi		Convertible Engine System Technology 532-06-12	W83-70097	EVAPOTRANSPIRATION	
188-46-56 Gamma Ray Astronomy	W83-70383	Turbine Engine Hot Section Technology (HOS	ST)	Hydrologic Information Extraction Technique 677-22-27	W83-70519
188-46-57 ENERGY STORAGE	W83-70386	533-04-12 Earth-to-Orbit Propulsion Life and Performan	W83-70115 ice Technology	EVOLUTION (DEVELOPMENT) Planetary Petrology	
Advanced Concepts in Energy Conversion 506-55-12	W83-70165	506-60-12 Variable Thrust OTV Propulsion Technology	W83-70206	153-02-40	W83-70299
Advanced Radiant Energy Conversion		506-60-42	W83-70210	Extended Atmospheres 154-80-80	W83-70316
506-55-13 Technology of Advanced Concepts	W83-70166	Engine Systems Facilities Operations		EXCIMER LASERS Development of Resonant Ionization Laser Sp.	ectroscopy for
506-55-15 Electric Propulsion Thruster Subsystem R&T	W83-70167	505-40-70 ENGINE TESTS	W83-70062	Tropospheric NOx Measurements	W83-70352
506-55-25	W83-70169	Propulsion Instrumentation	14/00 70044	EXERCISE PHYSIOLOGY	1103-10332
Advanced Electrochemical Systems 506-55-55	W83-70175	505-31-52 Advanced Fighter Aircraft (F-15)	W83-70014	Muscle Alterations 199-20-41	W83-70418
Advanced Power System Technology 506-55-76	W83-70181	533-02-21 Energy Efficient Engine Project	W83-70102	EXHAUST NOZZLES Inlets and Nozzles	
ENERGY TRANSFER Dynamics of Planetary Atmospheres		535-01-12 Reusable High Pressure Main Engine Technol	W83-70120	505-40-02	W83-70055
154-20-80	W83-70310	506-60-19	W83-70208	Non-Axisymmetric Nozzle Research 505-43-22	W83-70072
Extended Atmospheres 154-80-80	W83-70317	OTV Propulsion Performance and Plume C 506-60-49	haracterization W83-70211	Supersonic Propulsion Integration Technology 505-43-42	W83-70077
ENGINE AIRFRAME INTEGRATION Experimental/Applied Aerodynamics		ENVIRONMENT EFFECTS Tropospheric Air Quality - Technology Develo	pment	High Speed (Super/Hypersonic) Technology 505-43-83	W83-70082
505-31-23	W83-70008	146-20-10	W83-70250	EXOBIOLOGY	1105-70002
Inlets and Nozzles 505-40-02	W83-70055	Remote Sensing Applications for Facility Site Waste Disposal Impact Assessment		Medical Operations Longitudinal Studies 199-10-21	W83-70407
Engine Systems Research 505-40-62	W83-70061	677-60-15 ENVIRONMENT MANAGEMENT	W83-70548	Crew Health Maintenance 199-10-31	W83-70409
High Performance Aircraft Flight Dynamics & 505-43-13		Physical Oceanography 161-20-00	W83-70335	Systems Habitability Verification 199-10-41	W83-70411
High-Speed Aerodynamics and Propulsion Inte	egration	Oceanic Research Support Activities		Basic Mechanisms Underlying Space Motion S	Sickness
505-43-23 Interagency and Industrial Assistance and Test		161-50-00 ENVIRONMENT MODELS	W83-70344	199-20-22 Biological Adaptation	W83-70415
505-43-33 Supersonic Propulsion Integration Technology	W83-70076	Giotto Halley Modeling 156-03-01	W83-70319	199-40-32 Life in the Universe	W83-70433
505-43-42	W83-70077	ENVIRONMENT SIMULATION Aircraft loing Research		199-50-52	W83-70438
Structures & Materials Technology	•	505-45-02	W83-70084	Sample Bank 199-70-32	W83-70449
505-43-43 Hypersonic Propulsion Integration Technology	W83-70078	Food Requirements Production and Process 199-60-42	ing for CELSS W83-70444	Long Duration Life Sciences Satellite Progr 199-80-42	am Definition W83-70452
505-43-82	W83-70081	ENVIRONMENTAL CHEMISTRY Climate Modeling with Emphasis on Aerosols		Life Sciences Payload Accommodations	W83-70453
High Speed (Super/Hypersonic) Technology 505-43-83	W83-70082	146-10-04	W83-70249	199-80-48 Large Primate Facility	
Aerodynamics/Propulsion Integration 505-45-43	W83-70093	Tropospheric Air Quality - Technology Develo 146-20-10	pment W83-70250	199-80-52 Mammalian Development Facility	W83-70454
Integrated Research Aircraft Control (INTERACT)	Technology	ENVIRONMENTAL CONTROL Automations Technology for Manned Space 5		199-80-62 Interdisciplinary Research	W83-70455
533-02-41	W83-70105	506-54-67	W83-70164	199-90-71	W83-70456

EXTENSION DEGIGN					bozor mbzn
Ames Research Center Initiatives 199-90-72	W83-70457	Decoupler Pylon Flight Evaluation 533-02-71	W83-70109	Regional Crustal Deformation 676-10-10	W83-70506
EXPERIMENTAL DESIGN		F-4 AIRCRAFT		Lithospheric Structure and Evolution 676-30-05	W83-70507
OEX (Orbiter Experiments) Project Suppor 506-63-31	W83-70219	F-4C Spanwise Blowing Flight Investigati 533-02-31	ons W83-70103	FIRE CONTROL	W83-70507
Long Duration Life Sciences Satellite F 199-80-42	Program Definition W83-70452	F-4 Spanwise Blowing 533-02-33	W83-70104	AFTI/F-16 533-02-61	W83-70108
EXPERIMENTATION Extraterrestrial Materials Processing		FABRICATION Research in Advanced Material Concep		FIRE PREVENTION Aircraft Fire Safety Materials Testing	
179-40-62 Origin and Evolution of Life	W83-70359	505-33-10	W83-70017	505-45-17 FIREPROOFING	W83-70090
199-50-32	W83-70436	High Temperature Materials 505-33-12	W83-70018	Operational Problems Fireworthiness and	
Interdisciplinary Research 199-90-71	W83-70456	Composites for Advanced Space Systems 506-53-23	W83-70131	505-45-11 FIRES	W83-70088
EXPLOITATION Refining of Nonterrestrial Materials		FABRY-PEROT SPECTROMETERS Acousto-Optic & Submillimeter Device Te		Aviation Safety Technology - Applied Flu Materials Modeling	id Mechanics/Fire
506-53-17 EXPOSURE	W83-70130	506-54-16	W83-70151	505-45-15 FISHERIES	W83-70089
Medical Operations Longitudinal Studies		Optical Astronomy 196-41-71	W83-70399	Ocean Applications Development Program	
199-10-21 Biological Adaptation	W83-70407	FAR INFRARED RADIATION Far Infrared Detectors and Cooled Resear	ch	161-30-01 FLAME PROBES	W83-70340
199-40-32 EXTERNAL STORES	W83-70433	506-54-21 Research in Astrophysics at the Goddard	W83-70153	Computational Flame Radiation Research 505-31-41	W83-70011
Loads and Aeroelasticity 505-33-43	W83-70028	Studies and Columbia University		FLAME SPECTROSCOPY Computational Flame Radiation Research	
Decoupler Pylon Flight Evaluation		405-02-02 FAR ULTRAVIOLET RADIATION	W83-70465	505-31-41	W83-70011
533-02-71 Decoupler Pylon Flight Demonstration	W83-70109	Ultraviolet Detector Development 188-41-24	W83-70379	FLAMES Computational Flame Radiation Research	
533-02-73 EXTRACTION	W83-70110	FARM CROPS Multisensor Technique Development		505-31-41 Aviation Safety Technology - Applied Flu	W83-70011 id Mechanics/Fire
Refining of Nonterrestrial Materials 506-53-17	W83-70130	677-21-28 FARMLANDS	W83-70516	Materials Modeling 505-45-15	w83-70089
EXTRAGALACTIC RADIO SOURCES	***************************************	Thematic Mapper Simulator Land Res	ources Studies in	FLAMMABILITY	
Radio Metric Technology Development 310-10-60	W83-70557	Western Ecozones 677-21-26	W83-70515	Operational Problems Fireworthiness an 505-45-11	W83-70088
EXTRATERRESTRIAL LIFE Origin and Evolution of Life		Digital Mapping of Irrigated Cropland 677-60-11	W83-70547	Aviation Safety Technology - Applied Flu Materials Modeling	id Mechanics/Fire
199-50-32 Life in the Universe	W83-70436	Use of Thematic Mapper Data for Transmission Corridor Analysis and Siting		505-45-15 FLEXIBLE BODIES	W83-70089
199-50-52 The Search for Extraterrestrial Intelligence	W83-70438	677-60-19	W83-70549	Flight Loads Analysis 505-33-41	W83-70026
199-50-62	W83-70439	FATIGUE (BIOLOGY) Flight Management Systems		FLEXIBLE SPACECRAFT	VVB3-70026
Ames Research Center Initiatives 199-90-72	W83-70457	505-35-21 FATIGUE (MATERIALS)	W83-70038	Analysis and Design 506-53-53	W83-70143
EXTRATERRESTRIAL MATTER Planetary Materials Analysis		Life Prediction Fatigue Damage and Environ Metals and Composites	ironmental Effects	Advanced Control Technology 506-57-15	W83-70186
152-01-40 Curation of Extraterrestrial Samples	W83-70293	505-33-21	W83-70020	Solar Array Flight Experiment (SAFE) Dy Augmentation (Flights 1 and 2)	
152-04-40	W83-70296	Life Prediction for Structural Materials 505-33-23	W83-70022	506-62-49	W83-70215
JSC General Operations Support - Planeta 152-05-40	W83-70297	FAULT TOLERANCE Flight Control Concepts and Reliability En	hancement	Orbital Services 906-75-00	W83-70592
JPL Petrology Support 153-02-70	W83-70300	505-34-01 Control Theory and Methodology	W83-70030	FLIGHT ALTITUDE Clear Air Turbulence Studies Using P	assive Microwave
Chemical Evolution 199-50-12	W83-70434	505-34-02 AIRLAB Operations	W83-70031	Radiometers 505-45-05	W83-70086
EXTRATERRESTRIAL RADIATION Radiation Effects and Protection		505-34-23	W83-70035	FLIGHT CHARACTERISTICS Flight Control Concepts and Reliability En	
199-20-71	W83-70424	Aerospace Computer Science University F 505-37-20	W83-70051	505-34-01	W83-70030
EXTRATERRESTRIAL RESOURCES Extraterrestrial Materials Processing		Space Computer Science University Reserved: 506-54-50	arch W83-70158	High Performance Aircraft Flight Dyna Qualities	
179-40-62 Research of the use of Space Resources	W83-70359	Spacecraft Controls and Guidance 506-57-13	W83-70185	505-43-11 High Performance Aircraft Flight Dynamic	W83-70070 s & Controls
179-46-20 EXTRAVEHICULAR ACTIVITY	W83-70361	Future Data Systems Concepts	W83-70195	505-43-13 Supersonic Aerodynamics Configura	W83-70071
Human Factors for Crew Interfaces in Spa 506-57-27	oce W83-70192	506-58-11 Data Systems Research and Technology		Structures & Materials Technology	W83-70078
Teleoperations and Cryogenic Fluid Manag	gement	506-58-15 Spacecraft System Technology	W83-70197	505-43-43 Aerodynamics/Propulsion Integration	
506-64-29 Space Station Life Support Technology	W83-70238	506-64-15 FEASIBILITY ANALYSIS	W83-70231	505-45-43 F-4C Spanwise Blowing Flight Investigation	W83-70093 ons
506-64-31 Life Support Systems Technology Develop	W83-70239 ment	Advanced Radiant Energy Conversion 506-55-13	W83-70166	533-02-31 F-4 Spanwise Blowing	W83-70103
506-64-37 Advanced Extravehicular Systems (Space	W83-70240	Network Systems Technology Developme	nt	533-02-33 Propulsive-Lift Technology - QSRA Flight	W83-70104
199-60-21 Advanced Extravehicular Systems	W83-70442	310-20-33 FEEDBACK	W83-70560	533-02-50 Powered Lift Systems Technology - Harri	W83-70106
199-60-22	W83-70443	Basic Mechanisms Underlying Space Mot 199-20-22	W83-70415	Program	-
EXTREME ULTRAVIOLET RADIATION Development of Experiment and Hardware	9	FEEDBACK CONTROL OEX-Advanced Autopilot		533-02-51 Support for Forward Swept Wing (X-29A	
188-38-51 Development of Solar Experiments and Ha	W83-70371 ardware	506-63-42 FEVER	W83-70227	533-02-81 Space Shuttle Orbiter Flying Qualities Crit	W83-70111 eria (OEX)
188-38-51 Sounding Rocket Experiments	W83-70372	General biomedical Research	W92 70428	506-63-40 FLIGHT CONDITIONS	W83-70226
879-11-38	W83-70551	199-20-92 FIBER COMPOSITES	W83-70428	Flight Simulation Technology	W83-70041
EXTREMELY HIGH FREQUENCIES Advanced Communications Technology	Satellite (ACTS)	Fire Resistant Composites 505-33-31	W83-70023	505-35-33 Aviation Safety Severe Storm Hazards	
System Studies 650-60-26	W83-70478	Effects of Space Environment on Compos 506-53-25	ites W83-70132	505-45-03 Safety - Atmospheric Processes	W83-70085
Radio Systems Development 310-20-66		FIBER OPTICS Photophysics and Optical Information Pro-		505-45-09 FLIGHT CONTROL	W83-70087
310-20-00	W83-70566	506-54-11	W83-70147	Aircraft Controls Theory and Application 505-34-03	s W83-70032
F		Ultraviolet Detector Development 188-41-24	W83-70379	Advanced Navigation Guidance and Co	
•		Frequency and Timing Research 310-10-62	W83-70558	505-34-13 AIRLAB Operations	
F-104 AIRCRAFT Flight Support		FIELD EFFECT TRANSISTORS Deep Space and Advanced COMSAT	Communications	505-34-23 Crew Cockpit Interface Technology	W83-70035
533-02-91	W83-70113	Technology 506-58-25	W83-70202	505-35-23	W83-70039
F-111 AIRCRAFT Flight Loads Analysis		FILM COOLING	1103-70202	Graduate Program in Aeronautics 505-36-22	W83-70046
505-33-41 Interagency Assistance and Testing - Dryd	W83-70026 len	Detailed Aerothermal Loads 506-51-23	W83-70125	Geodynamics/Flight Dynamics of Pow- 505-43-01	ered Lift Vehicles W83-70068
505-43-31	W83-70074	FINANCIAL MANAGEMENT Geodynamics Investigations Support		Simulation Facilities Operations	W83-70100
(AFTI-F-111)	ntegration/F-111	676-01-01 FINITE DIFFERENCE THEORY	W83-70505	532-08-11 Powered Lift Systems Technology - Harri	
533-02-11 F-15 AIRCRAFT	W83-70101	Computational and Analytical Fluid Dynan		Program 533-02-51	W83-70107
Advanced Fighter Aircraft (F-15) 533-02-21		505-31-03 Dynamics of Planetary Atmospheres	W83-70003	Technology Requirements for Advanced Sp	
	14/92 70:02		1416		
F-16 AIRCRAFT	W83-70102	154-20-80 FINITE ELEMENT METHOD	W83-70309	Systems 506-63-23	W83-70216
F-16 AIRCRAFT AFTI/F-16 533-02-61	W83-70102 W83-70108	154-20-80	W83-70309 	Systems	W83-70216

FLIGHT CREWS Flight Management Systems	
505-35-21	W83-70038
FLIGHT HAZARDS Flight Simulation Technology	
505-35-33 B-57B Flight Investigation of Environmental F	W83-70041 lazards
505-45-01 Aircraft Icing Research	W83-70083
505-45-02 Aviation Safety Severe Storm Hazards	W83-70084
505-45-03	W83-70085
Safety - Atmospheric Processes 505-45-09	W83-70087
Operational Problems Fireworthiness and Cr 505-45-11	w83-70088
Aircraft Landing Dynamics 505-45-23	W83-70092
FLIGHT MECHANICS Aeronautics Graduate Research Program	
505-36-21 JIAFs Base Support	W83-70045
505-36-43 FLIGHT PLANS	W83-70048
Aircraft Fuel Efficiency Improvement 505-45-22	W83-70091
FLIGHT SAFETY	******
Flight Management Systems 505-35-21	W83-70038
Crew Cockpit Interface Technology 505-35-23	W83-70039
Aviation Safety Severe Storm Hazards 505-45-03	W83-70085
Safety - Atmospheric Processes 505-45-09	W83-70087
FLIGHT SIMULATION Crew Cockpit Interface Technology	. ,,
505-35-23 Piloted Simulation Technology	W83-70039
505-35-31	W83-70040
Flight Simulation Technology 505-35-33	W83-70041
Operational Problems Fireworthiness and Cr 505-45-11	w83-70088
Simulation Facilities Operations 532-08-11	W83-70100
Support for Forward Swept Wing (X-29A) 533-02-81	W83-70111
FLIGHT SIMULATORS Piloted Simulation Technology	
505-35-31	W83-70040
Flight Simulation Technology 505-35-33	W83-70041
Simulation Facilities Operations 532-08-11	W83-70100
FLIGHT STABILITY TESTS Space Shuttle Orbiter Flying Qualities Criteria	(OEX)
506-63-40 FLIGHT TEST VEHICLES	W83-70226
Highly Maneuverable Aircraft Technology F 533-03-11	
FLIGHT TESTS	light Research W83-70114
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21	
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51	W83-70114
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41	W83-70114 W83-70007
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43	W83-70114 W83-70007 W83-70013 W83-70026 W83-70028
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity	W83-70114 W83-70007 W83-70013 W83-70026 W83-70028
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program	W83-70011 W83-70013 W83-70026 W83-70028 Dement W83-70030
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations	W83-70014 W83-70007 W83-70013 W83-70026 W83-70028 tement W83-70030 W83-70045
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Auriframe Systems	W83-70014 W83-70007 W83-70013 W83-70026 W83-70028 Jement W83-70030 W83-70045 W83-70064
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamic	W83-70017 W83-70007 W83-70013 W83-70026 W83-70028 Sement W83-70030 W83-70045 W83-70064
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamic Qualities 505-43-11	W83-70014 W83-70007 W83-70013 W83-70026 W83-70028 Ementi W83-70045 W83-70064 W83-70065 s and Flying W83-70070
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamic Oualities 505-43-11 High Performance Aircraft Flight Dynamics & 505-43-13	W83-70014 W83-70007 W83-70013 W83-70026 W83-70028 Ementi W83-70045 W83-70064 W83-70065 s and Flying W83-70070
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamic Qualities 505-43-11 High Performance Aircraft Flight Dynamics & 505-43-13 Aircraft Icing Research 505-40-20	W83-70014 W83-70007 W83-70026 W83-70028 Jement W83-70030 W83-70045 W83-70065 s and Flying W83-70070 Controls
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Right Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Aufframe Systems 505-42-23 High Performance Aircraft Flight Dynamics 205-36-3-11 High Performance Aircraft Flight Dynamics 3505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70045 W83-70064 W83-70064 W83-70065 Es and Flying W83-70070 Controls W83-70071
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamics Cualities 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors	W83-70014 W83-70007 W83-70026 W83-70028 Sement W83-70030 W83-70045 W83-70065 s and Flying W83-70070 Controls W83-70071 W83-70084 W83-70084 W83-70084
EXperimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-54-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration	W83-70014 W83-70007 W83-70026 W83-70028 Bement W83-70030 W83-70045 W83-70064 W83-70065 S and Flying W83-70070 Controls W83-70071 W83-70084 W83-70093 W83-70093
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamics Cualities 505-43-11 High Performance Aircraft Flight Dynamics & 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70030 W83-70045 W83-70064 W83-70066 Es and Flying W83-70070 Controls W83-70071 W83-70084 W83-70093 W83-70095
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhances 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Aeromechanics and Configurations 505-42-23 High Performance Aircraft Flight Dynamics 205-43-11 High Performance Aircraft Flight Dynamics 8505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-31 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Interests	W83-70014 W83-70007 W83-70026 W83-70028 Bement W83-70030 W83-70045 W83-70064 W83-70065 S and Flying W83-70070 Controls W83-70071 W83-70084 W83-70093 W83-70093
EXPERIMENTAL TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhances 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Aufframe Systems 505-42-23 High Performance Aircraft Flight Dynamics 8: 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-11	W83-70014 W83-70007 W83-70026 W83-70028 W83-70045 W83-70064 W83-70064 W83-70065 s and Flying W83-70070 Controls W83-70071 W83-70078 W83-70099 W83-70099
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamics 005-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inte	W83-70014 W83-70007 W83-70026 W83-70028 Bement W83-70030 W83-70045 W83-70064 W83-70065 S and Flying W83-70071 W83-70070 Controls W83-70091 W83-70093 W83-70095 W83-70096
FLIGHT TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamic Cualities 505-43-11 High Performance Aircraft Flight Dynamics & 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-11 Advanced Fighter Aircraft (F-15)	W83-70014 W83-70007 W83-70026 W83-70028 Dement W83-70030 W83-70045 W83-70064 W83-70065 Description W83-70070 Controls W83-70071 W83-70093 W83-70099 W83-70096 W83-70096 W83-70099 W83-70099 gration/F-111 W83-70101
EXPERIMENTAL TESTS Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Aufframe Systems 505-42-13 High Performance Aircraft Flight Dynamics 8: 505-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-21 F-4C Spanwise Blowing Flight Investigations 533-02-31 F-4 Spanwise Blowing Flight Investigations 533-02-31	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70045 W83-70064 W83-70064 W83-70060 W83-70070 Controls W83-70071 W83-70091 W83-70095 W83-70099 gration/F-111 W83-70101 W83-70102 W83-70103
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Aufframe Systems 505-42-11 High Performance Aircraft Flight Dynamics 505-42-23 High Performance Aircraft Flight Dynamics \$05-43-31 Aircraft leng Research 505-43-13 Aircraft leng Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-11 Advanced Fighter Aircraft (F-15) 533-02-21 F-4 Spanwise Blowing Flight Investigations 533-02-33 Integrated Research Aircraft Control	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70045 W83-70045 W83-70064 W83-70070 Controls W83-70071 W83-70091 W83-70095 W83-70099 gration/F-111 W83-70101 W83-70101
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 I Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-11 High Performance Aircraft Flight Dynamics 205-43-11 High Performance Aircraft Flight Dynamics 205-43-13 Aircraft Icing Research 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-21 F-4 Spanwise Blowing Flight Investigations 533-02-33 Integrated Research Aircraft Control (INTERACT) 533-02-41	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70045 W83-70064 W83-70065 S and Flying W83-70070 Controls W83-70071 W83-70071 W83-70099 gration/F-111 W83-70101 W83-70102 W83-70103 W83-70104 W83-70103
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Illust Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Aircraft leing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-03 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-11 F-4 Spanwise Blowing Flight Investigations 533-02-31 F-4 Spanwise Blowing 533-02-33 Integrated Research Aircraft Control (INTERACT) 533-02-41 Propulsive-Lift Technology - QSRA Flight Exp	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70030 W83-70045 W83-70065 es and Flying W83-70070 Controls W83-70071 W83-70093 W83-70099 gration/F-111 W83-70101 W83-70102 W83-70103 W83-70104 Technology W83-70105 Ements W83-70105 Ements W83-70105
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Flight Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-23 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Aircraft leing Research 505-43-13 Aircraft leing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-11 Advanced Fighter Aircraft (F-15) 533-02-21 F-4 Cypanwise Blowing Flight Investigations 533-02-31 Integrated Research Aircraft Control (INTERACT) 533-02-41 Propulsive-Lift Technology - QSRA Flight Experiors 533-02-50 Powered Lift Systems Technology - Harner Fl	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70030 W83-70045 W83-70064 W83-70065 s and Flying W83-70070 Controls W83-70071 W83-70091 W83-70095 W83-70095 W83-70090 W83-70101 W83-70101 W83-70101 W83-70101 W83-70103 W83-70104 Technology W83-70106 ight Research
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Right Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-11 High Performance Aircraft Flight Dynamics 305-36-31 High Performance Aircraft Flight Dynamics 305-43-13 Aircraft Icing Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-11 Advanced Fighter Aircraft (F-15) 533-02-21 F-4C Spanwise Blowing Flight Investigations 533-02-33 Integrated Research Aircraft Control (INTERACT) 533-02-50 Powered Lift Systems Technology - Harner Fl	W83-70014 W83-70007 W83-70007 W83-70026 W83-70028 Ement W83-70045 W83-70045 W83-70064 W83-70064 W83-70070 Controls W83-70071 W83-70071 W83-70095 W83-70095 W83-70099 gratton/F-111 W83-70101 W83-70102 W83-70103 W83-70103 W83-70104 Technology W83-70105 eriments W83-70105 eriments W83-70106 ight Research W83-70107
Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Right Control Concepts and Reliability Enhance 505-34-01 Aeronautics Graduate Research Program 505-36-21 Rotorcraft Aeromechanics and Configurations 505-42-11 Rotorcraft Airframe Systems 505-42-11 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-11 Aircraft leng Research 505-43-13 Aircraft leng Research 505-45-02 Aerodynamics/Propulsion Integration 505-45-43 RSRA Flight Research/Rotors 532-03-11 Rotorcraft Systems Integration 532-06-11 Flight Experiments Support 532-07-11 Advanced Fighter Technology Inter (AFTI-F-111) 533-02-21 F-4C Spanwise Blowing Flight Investigations 533-02-33 Integrated Research Aircraft Control (INTERACT) 533-02-50 Powered Lift Systems Technology - Marner Fl Program 533-02-51	W83-70014 W83-70007 W83-70026 W83-70028 Ement W83-70030 W83-70045 W83-70064 W83-70065 s and Flying W83-70070 Controls W83-70071 W83-70091 W83-70095 W83-70095 W83-70090 W83-70101 W83-70101 W83-70101 W83-70101 W83-70103 W83-70104 Technology W83-70106 ight Research

Decoupler Pylon Flight Evaluation 533-02-71	W83-70109
Decoupler Pylon Flight Demonstration 533-02-73	W83-70110
Support for Forward Swept Wing (X-29A) 533-02-81	W83-70111
Forward Swept Wing Support 533-02-83	W83-70112
Flight Support 533-02-91	W83-70113
Highly Maneuverable Aircraft Technology Fl 533-03-11	
Structures Analysis and Synthesis 506-53-51	W83-70142
OEX (Orbiter Experiments) Project Support 506-63-31	W83-70219
OEX-Advanced Autopilot 506-63-42	W83-70227
Shuttle Operational Flight Test of a Large Sola 542-03-04	or Array W83-70242
Flight Test of an Ion Auxiliary Propulsion S 542-05-12	ystem (IAPS) W83-70248
Containerless Processing 179-80-30 Aircraft Borne LIDAR for O3 and OH Measure	W83-70364
673-14-00 Deployable Antenna Flight Experiment	W83-70500
906-90-00 LOW CHARACTERISTICS	W83-70594
Viscous Flows 505-31-11	W83-70004
Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-70009
Fan and Compressor Research 505-40-12	W83-70056
Advanced Turboprop-Installation Aerodynamics 535-03-11	
Detailed Aerothermal Loads 506-51-23	W83-70125
Shuttle Entry Air Data System (SEADS) 506-63-32	W83-70125
Dynamics of Planetary Atmospheres 154-20-80	W83-70220 W83-70310
LOW DISTRIBUTION Experimental/Theoretical Aerodynamics	W63-70310
505-31-21	W83-70007
High Speed (Super/Hypersonic) Technology 505-43-83	W83-70082
OTV Propulsion Performance and Plume Ch 506-60-49	W83-70211
Shuttle Infrared Leeside Temperature Sensing 506-63-34	(SILTS) W83-70221
Infrared Imagery of Shuttle 506-63-35	W83-70222
LOW EQUATIONS Numerical Aerodynamic Computational Technic	
ELOW EQUATIONS Numerical Aerodynamic Computational Techni 505-37-01 LOW MEASUREMENT	ques W83-70049
ILOW EQUATIONS Numerical Aerodynamic Computational Techni 505-37-01 ILOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13	
ILOW EQUATIONS Numerical Aerodynamic Computational Techni 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51	W83-70049
ILOW EQUATIONS Numerical Aerodynamic Computational Techni 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52	W83-70049 W83-70005 W83-70013 W83-70014
ILOW EQUATIONS Numerical Aerodynamic Computational Techni 505-37-01 ILOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation	W83-70049 W83-70005 W83-70013 W83-70014
ILOW EQUATIONS Numerical Aerodynamic Computational Techni 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Processi	W83-70049 W83-70005 W83-70013 W83-70014
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Processi 506-54-11 LOW STABILITY	W83-70049 W83-70005 W83-70013 W83-70014
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51	W83-70049 W83-70005 W83-70013 W83-70014 ng W83-70147
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation	W83-70049 W83-70005 W83-70013 W83-70014 ng W83-70147 W83-70009 W83-70013
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex	W83-70049 W83-70005 W83-70013 W83-70014 ng W83-70147 W83-70009
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations	W83-70049 W83-70005 W83-70013 W83-70014 ng W83-70147 W83-70009 W83-70013
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Proputsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41	W83-70049 W83-70005 W83-70013 W83-70014 ng W83-70147 W83-70009 W83-70009 W83-70013 W83-70046 W83-70126 W83-70233
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-29	W83-70049 W83-70005 W83-70013 W83-70014 M83-70009 W83-70009 W83-70046 W83-70126 W83-70233
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-29 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS	W83-70049 W83-70005 W83-70013 W83-70014 W83-70009 W83-70013 W83-70013 W83-70126 W83-70126 W83-70233
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-29 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27	W83-70049 W83-70005 W83-70013 W83-70014 M83-70009 W83-70013 W83-70013 W83-70023 W83-70233 W83-70238
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-52 LOWMETERS Graduate Program in Aeronautics 505-30-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research	W83-70049 W83-70005 W83-70013 W83-70014 W83-70009 W83-70013 W83-70013 W83-70126 W83-70233 W83-70238 W83-70238
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-52 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-29 Dynamics of Planetary Atmospheres 154-20-80 LUID FLIMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research 505-31-33 Cloud Physics	W83-70049 W83-70005 W83-70013 W83-700147 W83-70019 W83-70013 W83-70013 W83-70013 W83-70013 W83-70126 W83-70126 W83-70126 W83-70238 W83-70238 W83-70210
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-22 Trepoperations and Cryogenic Fluid Manageme 506-64-23 Tribological Experiments in Zero Gravity 542-03-27 LUID FLIMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT	W83-70049 W83-70005 W83-70013 W83-700147 W83-70009 W83-70013 W83-70013 W83-70216 W83-70233 W83-70238 W83-70310 W83-70245
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-32 LOWMETERS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-23 Tour Systems Operations 506-64-23 Tribological Experiments in Zero Gravity 542-03-27 LUID FLIMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-620	W83-70049 W83-70005 W83-70013 W83-700147 W83-70019 W83-70013 W83-70013 W83-70013 W83-70013 W83-70126 W83-70126 W83-70126 W83-70238 W83-70238 W83-70210
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-29 Unamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FILOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis	W83-70049 W83-70005 W83-70013 W83-70014 W83-70014 W83-70099 W83-70013 W83-70046 W83-70126 W83-70233 w83-70238 W83-70245 W83-70363 W83-70363
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-52 LOWMETERS Graduate Program in Aeronautics 505-30-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-29 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FILOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D	W83-70049 W83-70005 W83-70013 W83-700147 W83-70019 W83-70013 W83-70013 W83-70013 W83-70010 W83-70245 W83-70310 W83-70363 W83-70210 W83-70210
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-52 LOWMETERS Graduate Program in Aeronautics 505-30-52 Thermo-Gasdynamic Test Complex 506-56-1-41 Platform Systems Operations 506-64-22 Dynamics of Planetary Atmospheres 154-20-80 LUID PLIMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 506-61-42 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D Module 542-03-01	W83-70049 W83-70005 W83-70013 W83-700147 W83-70019 W83-70013 W83-70013 W83-70013 W83-70010 W83-70245 W83-70310 W83-70363 W83-70210 W83-70210
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-32 LOWMETERS Graduate Program in Aeronautics 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-22 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D Module 542-03-01 LUORESCENCE X-Ray Astronomy	W83-70049 W83-70005 W83-70013 W83-700147 W83-70009 W83-70013 W83-70013 W83-70126 W83-70126 W83-70126 W83-70233 W83-70245 W83-70210 W83-70363 W83-70210 W83-70009 rop Dynamics W83-70241
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-38-52 Thermo-Gasdynamic Test Complex 506-56-422 Thermo-Gasdynamic Test Complex 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-66-422 Teleoperations and Cryogenic Fluid Manageme 506-66-428 Tibloological Experiments in Zero Gravity 542-03-27 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FILOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D Module 542-03-01 LUORESCENCE X-Ray Astronomy 188-46-59 LUTTER	W83-70049 W83-70005 W83-70013 W83-70014 W83-70019 W83-70013 W83-70013 W83-70216 W83-70233 mt W83-70238 W83-70245 W83-70210 W83-70210 W83-70210 W83-7009 rop Dynamics
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-31 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-35 LUID DYNAMICS Graduate Program in Aeronautics 505-36-522 Thermo-Gasdynamic Test Complex 506-61-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-22 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FLOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D Module 542-03-01 LUORESCENCE X-Ray Astronomy 188-46-59 LUTTER Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-70049 W83-70005 W83-70013 W83-700147 W83-70009 W83-70013 W83-70013 W83-70126 W83-70126 W83-70126 W83-70233 W83-70245 W83-70210 W83-70363 W83-70210 W83-70009 rop Dynamics W83-70241
Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-31-51 LUID DYNAMICS Graduate Program in Aeronautics 505-36-22 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-29 Dynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID FILMS Tribological Experiments in Zero Gravity 579-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D Module 542-03-01 LUORESCENCE X-Ray Astronomy 188-46-59 LUTER Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Flight Loads Analysis 505-33-41	W83-70049 W83-70005 W83-70013 W83-70014 W83-70014 W83-70013 W83-70013 W83-70013 W83-70013 W83-70126 W83-70126 W83-70126 W83-70120 W83-70210 W83-70210 W83-70210 W83-70210 W83-70210 W83-70241 W83-70241
ILOW EQUATIONS Numerical Aerodynamic Computational Technis 505-37-01 LOW MEASUREMENT Viscous Drag Reduction and Control 505-31-13 Test Methods and Instrumentation 505-31-51 Propulsion Instrumentation 505-31-52 Photophysics and Optical Information Process 506-54-11 LOW STABILITY Fluid Mechanics of Turbomachinery/Lewis 505-31-32 LOWMETERS Test Methods and Instrumentation 505-31-52 LOWMETERS Graduate Program in Aeronautics 505-30-52 Thermo-Gasdynamic Test Complex 506-51-41 Platform Systems Operations 506-64-22 Teleoperations and Cryogenic Fluid Manageme 506-64-29 Oynamics of Planetary Atmospheres 154-20-80 LUID FILMS Tribological Experiments in Zero Gravity 542-03-27 LUID PLOW Aeroacoustics Research 505-31-33 Cloud Physics 179-75-10 LUID MANAGEMENT Variable Thrust OTV Propulsion Technology 506-60-42 LUID MECHANICS Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Development of a Shuttle Flight Experiment D Module 542-03-01 LUORESCENCE X-Ray Astronomy 188-46-59 LUTTER Fluid Mechanics of Turbomachinery/Lewis 505-31-32 Flight Loads Analysis	W83-70049 W83-70005 W83-70013 W83-70014 W83-70147 W83-70019 W83-70013 W83-70013 W83-70013 W83-70016 W83-70126 W83-70126 W83-70210 W83-70210 W83-70210 W83-70210 W83-70363 W83-70241 W83-70388 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009 W83-70009

Decoupler Pylon Flight Evaluation	
533-02-71 Decoupler Pylon Flight Demonstration	W83-70109
533-02-73 FLY BY WIRE CONTROL	W83-70110
Flight Control Concepts and Reliability Enhance 505-34-01	ement W83-7003
Advanced Controls and Guidance	
505-34-11 Highly Maneuverable Aircraft Technology Fli	W83-7003; ght Research
533-03-11 FLYWHEELS	W83-70114
Advanced Power System Technology 506-55-76	W83-7018
FOG	***************************************
Safety - Atmospheric Processes 505-45-09	W83-7008
FOG DISPERSAL Safety - Atmospheric Processes	
505-45-09 FOLDING STRUCTURES	W83-7008
Advanced Space Structures 506-53-43	W83-70140
Shuttle Operational Flight Test of a Large Sola	r Array
542-03-04 FOOD PROCESSING	W83-7024
Food Requirements Production and Processii 199-60-42	ng for CELS: W83-7044
Waste Management for CELSS 199-60-52	W83-7044!
FORCED VIBRATION	700
Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-7000
FORMAT Digital Image Recovery and Data Management	t
656-31-02 FORMING TECHNIQUES	W83-70482
Advanced Structural Alloys 505-33-13	W83-70019
FOURIER TRANSFORMATION	
Atomic and Molecular Properties of Planetary Constituents	
154-50-80 Planetary Instrument Development Progra	W83-70313 am/Planetan
Astronomy 157-05-50	W83-7032
Intercomparison of Dobson and Ir	nterferometri
Spectrometer 673-13-00	W83-70499
FRACTURE MECHANICS Life Prediction Fatigue Damage and Environn	nental Effect
in Metals and Composites 505-33-21	W83-70020
FRACTURE STRENGTH	
Composites for Advanced Space Systems 506-53-23	W83-7013
FRACTURES (MATERIALS) Life Prediction for Engine Materials	
Life Prediction for Engine Materials 505-33-22	W83-7002
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23	W83-7002
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Ci	W83-70022
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cit the Earth's Stratosphere 147-20-03	W83-70022
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS	W83-70022
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Ci the Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22	W83-70022
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Ci the Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron	W83-70022 constituents o W83-70276 W83-70527
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Ci the Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF	W83-70022 w83-70276 W83-70527 weter (SUMS W83-70224
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF) Development 506-63-43	W83-70022 w83-70276 W83-70527 weter (SUMS W83-70224
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cities Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAf Development 506-63-43 FREE RADICALS	W83-70022 w83-70276 W83-705276 w83-705276 w83-70224 w83-70228
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance	W83-70022 onstituents o W83-70276 W83-70527 neter (SUMS W83-70226 P) Experimen W83-70228 O Radicals o
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Troposphenic Importance 176-30-01 FREON	W83-70022 W83-70527 W83-70527 W83-70527 W83-70228 O Radicals o W83-7035
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Crithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00	W83-70022 W83-70527 W83-70527 W83-70527 W83-70228 O Radicals o W83-7035
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Critic Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION	w83-70222 w83-7052: w83-7052: w83-70222 oRadicals o w83-7035: s Distribution
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAf Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Troposphenc Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01	w83-70222 w83-7052: w83-7052: w83-70222 oRadicals o w83-7035: s Distribution
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42	W83-70022 w83-70276 W83-70527 W83-70527 W83-70226 O Radicals o W83-70356 s Distribution W83-70356
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 RANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Crithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 Frequency and Timing Research 310-10-62	W83-70022 w83-70276 W83-7052: w83-70226 W83-70226 O Radicals o W83-70356 s Distribution W83-70466
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 PREON Global Tropospheric Modeling of Trace Ga 176-10-00 PREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42 Frequency and Timing Research	W83-70226 W83-70276 W83-70527 W83-70227 Paper meter (SUMS W83-70226 O Radicals o W83-70356 W83-7046 W83-70466 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 PREE RADICALS Kinetic Studies Involving CH302 HO2 and It Troposphenc Importance 176-30-01 PREON Global Tropospheric Modeling of Trace Ga 176-10-00 PREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42 Frequency and Timing Research 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources	W83-70222 W83-70252 W83-70222 W83-70222 PERPERMENT W83-70228 O Radicals o W83-70356 S Distribution W83-70461 W83-70461 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 RANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT PRESISION TIME and Frequency Sources 310-10-42 FREQUENCY MODULATION Mobile Satellite Experiment	W83-70226 W83-70276 W83-70527 W83-70527 W83-70228 O Radicals o W83-70357 S Distribution W83-70356 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 RANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LIME DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAf Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MODULATION Mobile Satellite Experiment 650-60-00 Communications Systems Technology Develop	W83-70226 W83-70276 W83-70527 W83-70527 W83-70226 O Radicals o W83-70356 W83-70466 W83-70556 W83-70556 W83-70473 ment
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Crithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 PREON Global Tropospheric Modeling of Trace Ga 176-10-00 PREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-60 Communications Systems Technology Develop 310-20-67 FREQUENCY STABILITY	W83-70022 W83-70276 W83-70252 W83-70522 PSEXPERIMENT W83-70224 PSEXPERIMENT W83-70356 W83-70356 W83-70556 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42 Frequency and Timing Research 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Communications Systems Technology Develop 310-20-67 FREQUENCY STABILITY Frequency and Timing Research	W83-70226 W83-70276 W83-70276 W83-70226 Paper M83-70226 O Radicals o W83-70356 W83-70356 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Office of the Property of Trace of Trac	W83-70226 W83-70276 W83-70276 W83-70227 Paperimen W83-70228 O Radicals o W83-70356 W83-70466 W83-70556 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 RANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LIME DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAf Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-062 FREQUENCY MODULATION Mobile Satellite Experiment 650-60-00 Communications Systems Technology Develop 310-20-67 FREQUENCY STABILITY Frequency and Timing Research 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Transfer Expen	W83-70226 W83-70276 W83-70276 W83-70227 Paperimen W83-70228 O Radicals o W83-70356 W83-70466 W83-70556 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Troposphenc Importance 176-30-01 PREON Global Tropospheric Modeling of Trace Ga 176-10-00 PREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-39-01 Precision Time and Frequency Sources 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MODULATION Mobile Satellite Experiment 650-60 00 Communications Systems Technology Develop 310-20-67 FREQUENCY STANDARDS Shuttle Time and Frequency Transfer Experi	W83-70222 W83-70276 W83-70252 W83-70522 W83-70522 W83-70522 PExperimen W83-70228 O Radicals o W83-70350 W83-70350 W83-70556 W83-70556 W83-70556 W83-70556 W83-70567
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 PREE RADICALS Kinetic Studies Involving CH302 H02 and It Tropospheric Importance 176-30-01 PREON Global Tropospheric Modeling of Trace Ga 176-10-00 PREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 PREQUENCY MODULATION Mobile Satellite Experiment 650-60-00 Communications Systems Technology Develop 310-20-67 PREQUENCY STABILITY Frequency and Timing Research 310-10-62	W83-70022 W83-70276 W83-70276 W83-70522 Paper M83-70228 O Radicals o W83-70351 S Distribution W83-70356 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 FRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAf Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-042 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-062 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY STABILITY Frequency and Timing Research 310-10-62 FREQUENCY STABILITY Frequency and Timing Research 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Transfer Expent 676-659-41 Precision Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS FREQUENCY STANDA	W83-70022 W83-70276 W83-70276 W83-70227 Experimen W83-70228 O Radicals o W83-70356 W83-70356 W83-70466 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 Life Prediction for Structural Materials 505-33-32 RANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth's Stratosphere 147-20-03 FRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 FREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAf Development 506-63-43 FREE RADICALS Kinetic Studies Involving CH302 HO2 and It Tropospheric Importance 176-30-01 FREON Global Tropospheric Modeling of Trace Ga 176-10-00 FREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42 FREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 FREQUENCY MODULATION Mobile Satellite Experiment 650-60-00 Communications Systems Technology Develop 310-20-67 FREQUENCY STABILITY Frequency and Timing Research 310-10-62 FREQUENCY STABILITY Frequency and Timing Research 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Transfer Expen 676-59-41 Precision Time and Frequency Sources 310-10-42 Frequency and Timing Research 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS	W83-70022 W83-70276 W83-70276 W83-70227 Experimen W83-70228 O Radicals o W83-70356 W83-70356 W83-70466 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556
Life Prediction for Engine Materials 505-33-22 Life Prediction for Structural Materials 505-33-22 Life Prediction for Structural Materials 505-33-23 PRANCK-CONDON PRINCIPLE Quantitative Infrared Spectroscopy of Minor Cithe Earth s Stratosphere 147-20-03 PRAUNHOFER LINE DISCRIMINATORS Luminescence Detector from Space 677-29-22 PREE MOLECULAR FLOW Shuttle Upper Atmosphere Mass Spectron 506-63-37 High Resolution Accelerometer Package (HiRAF Development 506-63-43 PREE RADICALS Kinetic Studies Involving CH302 HO2 and It Troposphenc Importance 176-30-01 PREON Global Tropospheric Modeling of Trace Ga 176-10-00 PREQUENCY DISTRIBUTION Solar and Heliospheric Physics Data Analyses 385-38-01 Precision Time and Frequency Sources 310-10-42 Frequency and Timing Research 310-10-62 PREQUENCY MEASUREMENT Precision Time and Frequency Sources 310-10-62 PREQUENCY MODULATION Mobile Satellite Experiment 650-60 00 Communications Systems Technology Develop 310-20-67 PREQUENCY STANDARDS Shuttle Time and Frequency Transfer Expen 676-59-41 Precision Time and Frequency Transfer Expen 676-59-41 Precision Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Transfer Expen 676-59-41 Precision Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS Shuttle Time and Frequency Sources 310-10-62 FREQUENCY STANDARDS	W83-70022 W83-70276 W83-70276 W83-70252 Paper M83-70228 O Radicals o W83-70351 S Distribution W83-70356 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556 W83-70556

FUEL CONSUMPTION Engine Systems Research		GAS FLOW Photophysics and Optical Information Pro-	cessing	SIR-A Data Analysis 677-43-18	W83-7054
505-40-62 Aircraft Fuel Efficiency Improvement	W83-70061	506-54-11	W83-70147	GEOMAGNETISM Investigation of Upper Atmosphere Dynamic	ce with Nimbue.
505-45-22	W83-70091	GAS TURBINE ENGINES Burning Fundamentals & Heat Transfer		Satellite Data	
Propulsive-Lift Technology - QSRA Flight Expe 533-02-50	riments W83-70106	505-31-42	W83-70012	673-31-00 Geopotential Research Mission (GRM) GRA	W83-70503 VSAT/MAGSAT
Energy Efficient Engine Project		Propulsion Instrumentation 505-31-52	W83-70014	Studies	,
535-01-12 FUEL CONTROL	W83-70120	High Temperature Materials 505-33-12	W83-70018	676-59-10 GEOMETRIC ACCURACY	W83-70509
In-Space Fluid Management Technology - God		Life Prediction for Engine Materials		Attitude Tracker Feasibility Study	14/00 7050
506-64-26 FURLABLE ANTENNAS	W83-70236	505-33-22 High Temperature Engine Composites	W83-70021	677-29-17 GEOMETRIC RECTIFICATION (IMAGERY)	W83-7052
Advanced Space Structures		505-33-32	W83-70024	Attitude Tracker Feasibility Study	W00 7050
506-53-43 Advanced Space Structures Antenna	W83-70140 Technology	Fan and Compressor Research 505-40-12	W83-70056	677-29-17 Topographic Mapping Methods	W83-70529
Development		Combustors and Turbines		677-43-17	W83-70540
506-53-45 FU\$ELAGES	W83-70141	505-40-22 Turbine Engine Hot Section Technology (I	W83-70057 HOST)	GEOMORPHOLOGY Hydrologic Information Extraction Technic	que Developmen
Structural Integration		533-04-12	W83-70115	677-22-27	W83-70519
534-03-13 Advanced Turboprop Program	W83-70116	GAS-METAL INTERACTIONS Surface Physics and Computational Chem	isto.	Geobotanical Mapping in the Eastern Unite 677-42-07	d States W83-70538
535-03-12	W83-70122	506-53-11	W83-70127	GEOPHYSICAL FLUID FLOW CELLS	
		GASDYNAMIC LASERS Thermo-Gasdynamic Test Complex		Studies of Dynamics of Atmospheric Flows 146-76-00	W83-70264
G		506-51-41	W83-70126	GEOPHYSICAL FLUIDS	
GALACTIC EVOLUTION		GASEOUS DIFFUSION Cloud Physics		Studies of Dynamics of Atmospheric Flows 146-76-00	W83-70264
UV and Optical Astronomy		179-75-10	W83-70363	GEOPHYSICS	
188-41-51	W83-70380	GASEOUS ROCKET PROPELLANTS Advanced Low Thrust Chemical Prop	ulsion Technology	High Resolution Laser Research 506-54-23	W83-70154
Theoretical Studies of Galaxies Active Galactii Quasi Stellar Objects	c Nuclei and	506-60-25	W83-70209	Sensor Research and Technology	
188-41-53	W83-70381	GEARS Power Transfer Research		506-54-26 JSC General Operations - Geophysics & Ge	W83-70156
GALACTIC NUCLEI Theoretical Studies of Galaxies Active Galacti	c Nuclei and	505-40-42	W83-70059	153-10-40	W83-70307
Quasi Stellar Objects	14/00 70004	GELS Glass Research		Aircraft Borne LIDAR for O3 and OH Meas 673-14-00	urements W83-70500
188-41-53 GALACTIC RADIATION	W83-70381	179-11-20	W83-70353	GEOPOTENTIAL	
High Energy Astrophysics Data Analysis	W83-70464	GENERAL AVIATION AIRCRAFT Propeller Research		Geopotential Research Mission (GRM) GRA Studies	VSAI/MAGSA
385-46-01 GALACTIC STRUCTURE	VV83-70464	505-40-32	W83-70058	676-59-10	W83-70509
Gamma-Ray Astronomy	W83-70385	Engine Systems Research 505-40-62	W83-70061	GEOPRESSURE JPL Petrology Support	
188-46-57 Research in Astrophysics at the Goddard Institu		Aircraft loing Research		153-02-70	W83-70300
Studies and Columbia University	W83-70465	505-45-02 Aerodynamics/Propulsion Integration	W83-70084	GEOSYNCHRONOUS ORBITS Manned Facilities	
405-02-02 GALAXIES	W83-70405	505-45-43	W83-70093	906-54-00	W83-70578
UV and Optical Astronomy 188-41-51	W83-70380	GENETICS Developmental Biology		GEOTEMPERATURE JPL Petrology Support	
Theoretical Studies of Galaxies Active Galacti		199-40-22	W83-70432	153-02-70	W83-70300
Quasi Stellar Objects 188-41-53	W83-70381	GEOBOTANY Oil and Gas Test Case Study		GLASS Refining of Nonterrestrial Materials	
Sounding Rockets Experiments (Astronomy)		677-41-16	W83-70532	506-53-17 Glass Research	W83-70130
879-11-41 GALILEO PROJECT	W83-70552	Use of TM for the Detection of Mineraliza Terrain Through Inference of Geobotanical P.		179-11-20	W83-70353
Thermo-Gasdynamic Test Complex		677-42-04	W83-70536	Containerless Processing 179-80-30	W83-70364
506-51-41 Planetary Atmospheric Composition Structure	W83-70126	Remote Sensing Techniques for Geobotani of Chromium-Bearing Rock Types	cal Discrimination	GLOBAL AIR POLLUTION	VV03-7030-
154-10-80	W83-70308	677-42-05	W83-70537	Climate Modeling with Emphasis on Aeroso 146-10-04	ols W83-70249
Remote Sensing of Atmospheric Structure 154-40-80	W83-70312	Geobotanical Mapping in the Eastern Unit 677-42-07	ed States W83-70538	GLOBAL ATMOSPHERIC RESEARCH PROG	RAM
Planetary Data Network Project	VV63-70312	GEOCHEMISTRY		Meteorological Satellite Data Research 146-61-00	and Applications W83-70252
656-80-01	W83-70489	Planetary Materials Analysis 152-01-40	W83-70293	Global Weather Experiment Data Processii	ng and Research
GALLIUM ARSENIDES Electronics Research and Technology		Planetary Materials Laboratory and Analy		146-64-00 Global Weather Research - Microwave F	W83-70253
506-54-15	W83-70150	152-02-40 Planetary Petrology	W83-70294	146-72-01	W83-70258
Photovoltaic Research and Technology 506-55-42	W83-70170	153-02-40	W83-70299	GLOBAL POSITIONING SYSTEM Advanced Earth Orbiter Radio Met	tric Technology
Deep Space and Advanced COMSAT Com		JPL Petrology Support 153-02-70	W83-70300	Development	
Technology	W83-70202	Early Crustal Genesis	W83-70306	161-10-03 SERIES - Satellite Emission Range Inferred	W83-70334
506-58-25 GAMMA RAY ASTRONOMY	VV83-70202	153-09-40 JSC General Operations - Geophysics & G		676-59-30	W83-70510
Experiment Development - Laboratory and The	oretical Solar	153-10-40	W83-70307	GONDOLAS Multi-Sensor Balloon Measurements	
Physics 188-38-53	W83-70376	Chemical Evolution 199-50-12	W83-70434	147-16-01	W83-70274
Gamma Ray Astronomy and Related Research		GEOCHRONOLOGY Planetary Materials Analysis		GOVERNMENT PROCUREMENT Computational Facilities	
188-46-57	W83-70384	152-01-40	W83-70293	505-37-32	W83-70054
Gamma-Ray Astronomy 188-46-57	W83-70385	GEODESY SERIES - Satellite Emission Range Inferre	d Earth Supraving	GOVERNMENT/INDUSTRY RELATIONS Interagency & Industrial Assistance & Testi	ina
Gamma Ray Astronomy		676-59-30	W83-70510	505-43-32	W83-70075
188-46-57 GAMMA RAY SPECTRA	W83-70386	GEODYNAMICS Geodynamics Investigations Support		Ocean Applications Development Program 161-30-01	W83-70340
Cross Section Determination Cosmic R		676-01-01	W83-70505	GRANTS	
Background Determination Neutron Transport Ca Planetary Evaluation and Dynamic Studies	lculation and	Regional Crustal Deformation 676-10-10	W83-70506	Funds for Independent Research (Aeronauti 505-36-11	w83-70042
153-03-50	W83-70301	Lithospheric Structure and Evolution		Fund for Independent Research (Aeronaution	:s)
GAMMA RAY SPECTROMETERS X-Ray Gamma-Ray and Neutron/Gamma-Ray	Mathods for	676-30-05 SERIES - Satellite Emission Range Inferre	W83-70507	505-36-12 Fund for Independent Research (Aeronautic	W83-70043 :s)
Planetary Exploration		676-59-30	W83-70510	505-36-13	W83-70044
157-03-50	W83-70324	GEOIDS Altimeter Time-Dependent Current Studies		Graduate Program in Aeronautics 505-36-23	W83-70047
Planetary Instrument Definition 157-20-70	W83-70329	161-20-07	w83-70336	JIAFs Base Support	W83-70047
GAMMA RAY TELESCOPES		GEOLOGICAL FAULTS		505-36-43	W83-70048
Development of Solar Experiments and Hardwa 188-38-51	are W83-70372	Regional Crustal Deformation 676-10-10	W83-70506	GRAPHITE-EPOXY COMPOSITES Life Predicton Fatigue Damage and Envir	onmental Effects
GAMMA RAYS		GEOLOGICAL SURVEYS	ad States	in Metals and Composites	
Cross Section Determination Cosmic R		Geobotanical Mapping in the Eastern Unit 677-42-07	W83-70538	505-33-21 GRASSLANDS	W83-70020
Background Determination Neutron Transport Ca Planetary Evaluation and Dynamic Studies	iculation and	Use of SAR for Geologic Mapping	W(02 70E20	Monitoring Large Scale Total Primary	Production and
153-03-50	W83-70301	677-43-16 GEOLOGY	W83-70539	Desertification Processes with AVHRR Image 199-30-07	
GAS ANALYSIS Tropospheric Air Quality - Technology Develop	ment	Long Wavelength Subsurface Sounder 677-29-23	W83-70528	GRAVITATION	1103-70425
146-20-10	W83-70250	High Spectral Resolution Techniques for	Geologic Mapping	Lithospheric Structure and Evolution	W00 7050
GAS CHROMATOGRAPHY Solar System Environments		677-41-14	W83-70531 temote Sensing	676-30-05 GRAVITATIONAL EFFECTS	W83-70507
199-50-42	W83-70437	Techniques	•	Formation Evolution and Stability of Pri	
GAS DYNAMICS Advanced Transportation	-	677-41-23 Use of SAR for Geologic Mapping	W83-70535	153-01-60 Spherical Shell Technology Study	- W83-70298
	W83-70583	677-43-16	W83-70539	179-20-57	W83-70358

W83-70358

Containerless Processing 179-80-30	W83-70364	GROWTH Developmental Biology		Shuttle Infrared Leeside Temperature Se 506-63-34	nsing (SILTS) W83-70221
Bioseparation Processes		199-40-22	W83-70432	Platform Systems Operations	
179-80-40 Reduced Gravity Combustion Science	W83-70365	Mammalian Development Facility 199-80-62	W83-70455	506-64-22	W83-70233
179-80-51	W83-70366	GUIDANCE (MOTION)		Teleoperations and Cryogenic Fluid Man 506-64-29	W83-70238
Solidification Processes 179-80-60	W83-70367	Mathematics for Engineering and Science 505-31-83	W83-70016	Spherical Shell Technology Study	1400 70050
Crystal Growth Processes		GULF OF MEXICO		179-20-57 HEAT TREATMENT	W83-70358
179-80-70 Developmental Biology	W83-70368	Gulf of Mexico Circulation Studies 161-20-10	W83-70337	Advanced Structural Alloys	
199-40-22	W83-70432	GYROSCOPIC STABILITY		505-33-13 Electrically Conductive Thermal Control	W83-70019
Biological Adaptation 199-40-32	W83-70433	Gravity Probe - B 188-78-41	W83-70392	506-53-26	W83-70133
Vestibular Research Facility (VRF)/Variable				HEAVY IONS	
Facility (VGRF) 199-80-32	W83-70451	н		Radiation Effects and Protection 199-20-76	W83-70426
GRAVITATIONAL FIELDS				HELICOPTER CONTROL	
GRAVSAT Study 676-40-01	W83-70508	H LINES Ground-Based Observations UV and C		Rotorcraft Flight Guidance Systems Tecl 532-01-11	hnology W83-70094
Geopotential Research Mission (GRM) GI		188-41-21	W83-70377	Rotorcraft Systems Integration	
Studies 676-59-10	W83-70509	HALLEY'S COMET		532-06-11	W83-70096
GRAVITATIONAL WAVES		Extended Atmospheres 154-80-80	W83-70317	HELICOPTER DESIGN Rotorcraft Systems Integration	
Gravitational Wave Astronomy and Cosm 188-41-22	ology W83-70378	International Halley Watch 156-02-02	W83-70318	532-06-11	W83-70096
GRAVITY GRADIOMETERS	1100 10010	Giotto Halley Modeling	WB3-70316	HELICOPTER ENGINES Rotorcraft-Operating Problems	
Superconducting Gravity Gradiometer 676-59-33	W83-70511	156-03-01	W83-70319	505-42-32	W83-70066
GRAVITY PROBE B	1100-70311	Giotto Ephemeris Support 156-03-02	W83-70320	HELICOPTER PERFORMANCE	
Gravity Probe - B 188-78-41	W83-70392	Giotto Ion Mass Spectrometer Co-Investig	ator Support	Rotorcraft Aeromechanics and Configura 505-42-11	W83-70064
GRAVSAT SATELLITE	W03-70332	156-03-03 Giotto particulate Impact Analyzer (PIA)	W83-70321 Co-Investigator	Rotorcraft Flight Guidance Systems Tecl	hnology
GRAVSAT Study	W83-70508	Support		532-01-11	W83-70094
676-40-01 GRAZING INCIDENCE		156-03-04 Giotto Dust Impact Detection System (DII	W83-70322 DSY)	RSRA Flight Research/Rotors 532-03-11	W83-70095
Development of Solar Experiments and	fardware W83-70372	156-03-07	W83-70323	Rotorcraft Systems Integration	
188-38-51 X-Ray Astronomy CCD Instrumentation [HARDWARE Advanced Equipment Development		532-06-11 HELICOPTER PROPELLER DRIVE	W83-70096
188-46-59	W83-70389	199-80-31	W83-70450	Power Transfer Research	30050
GRINDING (MATERIAL REMOVAL) Advanced X-Ray Astrophysics Facility (A	XAF)	Mammalian Development Facility 199-80-62	W83-70455	505-40-42 Rotorcraft-Operating Problems	W83-70059
159-46-01	W83-70331	HARMONIC ANALYSIS		505-42-32	W83-70066
GROUND BASED CONTROL Attitude/Orbit Technology		Investigation of Upper Atmosphere Dynami Satellite Data	cs with Nimbus-7	Rotorcraft Vibration and Noise 532-06-13	W83-70098
310-10-26	W83-70555	673-31-00	W83-70503	HELICOPTER WAKES	
Mission Operations Technology 310-40-45	W83-70573	Variability and Trends in Stratospheric C Atmosphere and UV Solar Flux Variations	zone the Middle	Rotorcraft Aeromechanics and Configura 505-42-11	w83-70064
GROUND EFFECT (AERODYNAMICS)		673-41-00	W83-70504	HELICOPTERS	
Geodynamics/Flight Dynamics of Pow 505-43-01	vered Lift Vehicles W83-70068	HARMONICS Advanced Containerless Processing Technical	ology	Rotorcraft Aeromechanics and Configura 505-42-11	w83-70064
GROUND EFFECT MACHINES		179-20-55	W83-70356	Rotorcraft Airframe Systems	
Aircraft Landing Dynamics 505-45-23	W83-70092	HARRIER AIRCRAFT Powered Lift Systems Technology - Harrie	r Elight Pasaarch	505-42-23 Rotorcraft-Operating Problems	W83-70065
GROUND OPERATIONAL SUPPORT SYST	rem .	Program	•	505-42-32	W83-70066
Operations Support Computing Technolo 310-40-26	gy W83-70571	533-02-51 HEAD-UP DISPLAYS	W83-70107	Aircraft long Research 505-45-02	W83-70084
Systems Management Technology		Propulsive-Lift Technology - QSRA Flight		Rotorcraft Vibration and Noise	
310-40-49 GROUND STATIONS	W83-70575	533-02-50 HEALTH	W83-70106	532-06-13 Simulation Facilities Operations	W83-70098
On-line Data Ingest/Staging System		Crew Health Maintenance		532-08-11	W83-70100
506-58-19 SERIES - Satellite Emission Range Inferr	W83-70199 ed Earth Surveying	199-10-31 Crew Health Maintenance	W83-70409	Flight Support 533-02-91	W83-70113
676-59-30	W83-70510	199-10-32	W83-70410	HELIUM	
Antenna Systems Development 310-20-65	W83-70565	Cardiovascular Deconditioning (JSC) 199-20-11	W83-70412	Solar and Heliospheric Physics Data Ana 385-38-01	w83-70461
Human-to-Machine Interface Technology		HEAT EXCHANGERS		HEMATOPOIESIS	
310-40-37 Mission Operations Technology	W83-70572	Thermal Management for On-Orbit Energy 506-55-77	Systems W83-70182	Blood Alterations (Influence of Space and Blood-Forming Tissues)	night on the Blood
310-40-45	W83-70573	HEAT FLUX		199-20-51	W83-70420
Systems Management Technology 310-40-49	W83-70575	Meteorological Satellite Data Research 146-61-00	and Applications W83-70252	HEMOGLOBIN Blood Alterations	
GROUND SUPPORT EQUIPMENT		HEAT PIPES		199-20-52	W83-70421
Rotorcraft Flight Guidance Systems Tech 532-01-11	mology W83-70094	Thermal to Electric Energy Conversion Tec 506-55-65	hnology W83-70177	HEMOLYSIS Blood Alterations	
Flight Experiments Support		Advanced Power System Technology		199-20-52	W83-70421
532-07-11 Powered Lift Systems Technology - Hari	W83-70099 per Flight Research	506-55-76 Thermal Management for On-Orbit Energy	W83-70181	HETERODYNING Acousto-Optic & Submillimeter Device 1	Technology
Program		506-55-77	W83-70182	506-54-16	W83-70151
533-02-51 Research Airport Operation	W83-70107	HEAT RADIATORS Thermal Management for On-Orbit Energy	Customa	Planetary Instrument Development P Astronomy	rogram / Planetary
534-04-16	W83-70119	506-55-77	W83-70182	157-05-50	W83-70328
General Ground Support Equipment Technology Extension	(GSE) Software	HEAT RESISTANT ALLOYS		Infrared and Sub-Millimeter Astronomy 188-41-55	W83-70382
656-90-01	W83-70491	High Temperature Materials 505-33-12	W83-70018	HEURISTIC METHODS	
Advanced Space Transportation Operations	Systems Ground	High Temperature Engine Composites		Advanced Concepts for Knowledge-Base 506-54-61	sed Expert Systems W83-70160
906-64-21	W83-70585	505-33-32	W83-70024	HIGH GRAVITY ENVIRONMENTS	7703-70700
Space Station Ground Operations Study 906-64-22	Follow on Study W83-70586	Thermal Protection Systems for Earth-To-0 506-53-33	W83-70137	Solidification Processes 179-80-60	W83-70367
Orbital Transfer Vehicle Ground Operatio		Thermal to Electric Energy Conversion Tec	hnology	Biological Adaptation	W83-70307
906-64-24	W83-70588	506-56-65 HEAT SHIELDING	W83-70177	199-40-32 HIGH RESOLUTION	W83-70433
GROUND SUPPORT SYSTEMS Aircraft Landing Dynamics		STARPROBE - Advanced Technology	Management &	Ultraviolet Detector Development	
505-45-23	W83-70092	Planning 188-78-38	-	188-41-24	W83-70379
Flight Experiments Support 532-07-11	W83-70099	HEAT SINKS	W83-70390	Ground-Based Infrared Astronomy 196-41-50	W83-70394
Ground-Based Observations of the Sun	W83-70373	Thermal Management for On-Orbit Energy		Advanced Radar Concepts and Systems	
188-38-52 GROUND TRUTH	vv63-703/3	506-55-77 HEAT SOURCES	W83-70182	677-29-18 High Spectral Resolution Techniques for	
Absolute Solar Flux and Variability	W83-70501	Thermal to Electric Energy Conversion Tec	hnology	677-41-14	W83-70531
673-15-00 Renewable Resources Field Research ar		506-55-65	W83-70177	HIGH REYNOLDS NUMBER High Performance Aircraft Flight Di	ynamics and Flying
Analysis		HEAT TRANSFER Burning Fundamentals & Heat Transfer		Qualities	-
677-21-24 Chromite Test Case Study	W83-70513	505-31-42	W83-70012	505-43-11 Thermo-Gasdynamic Test Complex	W83-70070
677-41-17	W83-70533	Non-Axisymmetric Nozzle Research 505-43-22	W83-70072	506-51-41	W83-70126
Geobotanical Mapping in the Eastern Un 677-42-07	ited States W83-70538	Entry Vehicle Aerothermodynamics	***************************************	HIGH SPEED Submillimeter & Optical Processing Dev	ice Research
GROUP DYNAMICS		506-51-13	W83-70124	506-54-12	W83-70148
Human Behavior and Performance 199-20-82	W83-70427	Variable Thrust OTV Propulsion Technolog 506-60-42	y W83-70210	Global Weather Experiment Data Proce 146-64-00	ssing and Research W83-70253
		,	,,33-,3210		

HIGH SPEED CAMERAS		Theoretical Studies of Galaxies Active Galac	tic Nuclei and	Interagency & Industrial Assistance & Testin	ıg
Experimental Impact Cratering 153-08-40	W83-70304	Quasi Stellar Objects 188-41-53	W83-70381	505-43-32 B-57B Flight Investigation of Environmental	W83-70075
HIGH TEMPERATURE	1105 70004	HYDROGEN IONS		505-45-01	W83-70083
Solar Cell Research 506-55-43	W83-70171	Ground-Based Observations UV and Opti 188-41-21	W83-70377	Aircraft loing Research 505-45-02	W83-70084
HIGH TEMPERATURE ENVIRONMENTS Advanced Containerless Processing Technology	ogy	HYDROGEN MASERS Shuttle Time and Frequency Transfer Expe	riment (STIET)	ICE PREVENTION Rotorcraft-Operating Problems	
179-20-55 Electrostatic Containerless Processing Techn	W83-70356	676-59-41	W83-70512	505-42-32 ICE REPORTING	W83-70066
179-20-56	W83 70357	Precision Time and Frequency Sources 310-10-42	W83-70556	Ocean Applications Development Program	
HIGH TEMPERATURE TESTS Structures Analysis and Synthesis		HYDROGEN OXYGEN ENGINES		161-30-01 Polar Oceanography	W83-70340
506-53-51 HIGH VOLTAGES	W83-70142	OTV Propulsion Performance and Plume C 506-60-49	W83-70211	161-40-00 IGNITION	W83-70342
Power Systems Management and Distribution 506-55-72		HYDROGEN OXYGEN FUEL CELLS Electrochemical Energy Conversion and Stora	ne.	Aviation Safety Technology - Applied Fluid	Mechanics/Fire
Spacecraft Power Systems R & T	W83-70179	506-55-52	W83-70174	Materials Modeling 505-45-15	W83-70089
506-55-75 Multi-100 kW Low Cost Earth Orbital Syste	W83-70180 ms	HYDROGEN PEROXIDE Chemical Kinetics of the Upper Atmosphere		IMAGE INTENSIFIERS Acousto-Optic & Submillimeter Device Tech	nology
506-55-79 Solar Array Flight Experiment (SAFE) Dyna	W83-70183	147-21-03	W83-70278	506-54-16	W83-70151
Augmentation (Flights 1 and 2)		HYDROGRAPHY Ocean Optics		Ultraviolet Detector Development 188-41-24	W83-70379
506-62-49 HOLOGRAPHIC INTERFEROMETRY	W83-70215	161-30-00 Oceanic Research Support Activities	W83-70339	IMAGE MOTION COMPENSATION Attitude Tracker Feasibility Study	
Test Methods and Instrumentation 505-31-51	W83-70013	161-50-00	W83-70344	677-29-17 IMAGE PROCESSING	W83-70525
HOMEOSTASIS	***************************************	HYDROLOGY Global Ecology		Data Systems Research and Technology	
Biological Adaptation 199-40-32	W83-70433	199-30-31	W83-70430	506-58-13 FILE Flight ExperimentsAnalysis and Suppl	W83-70196 ort
HORIZONTAL SPACECRAFT LANDING Space Shuttle Orbiter Flying Qualities Criteri	a (OFX)	Hydrologic Information Extraction Technique 677-22-27	W83-70519	542-03-14 Extended Atmospheres	W83-70243
506-63-40	W83-70226	HYDROLOGY MODELS Gulf of Mexico Circulation Studies		154-80-80	W83-70317
HORMONES Bone Loss		161-20-10	W83-70337	Coupled Active-Passive Sea Ice Analysis 161-40-02	W83-70343
199-20-31 Muscle Alterations	W83-70416	Hydrologic Information Extraction Technique 677-22-27	Development W83-70519	Application of Digital Image Processing Astronomical Imagery	Techniques to
199-20-41	W83-70418	HYDROTHERMAL SYSTEMS		385-41-01	W83-70462
Fluid and Electrolyte Change 199-20-61	W83-70422	Hydrothermal Ore System Detection in Partia Mountainous Terrain		Data Analysis Astronomy 385-41-01	W83-70463
Fluid and Electrolyte Changes 199-20-62	W83-70423	677-41-13 HYDROXYL RADICALS	W83-70530	Information Sciences Research and Develops 656-30-01	ment W83-70481
HOVERING	1103-70423	Upper Atmosphere Research - Field Measurer	ments W83-70266	Transportable Applications Executive (TAE)	
Powered Lift Propulsion Technology 505-43-02	W83-70069	147-11-00 Aircraft Borne LIDAR for O3 and OH Measur	ements	656-44-10 Advanced Technology Image Digitization	W83-70486
HUMAN BEHAVIOR Human Behavior and Performance		673-14-00 HYGIENE	W83-70500	656-60-10 Chromite Test Case Study	W83-70488
199-20-82	W83-70427	Life Support Systems Technology Developme		677-41-17	W83-70533
HUMAN CENTRIFUGES Operational Laboratory		506-64-37 Advanced Life Support Systems	W83-70240	SIR-A Data Analysis 677-43-18	W83-70541
199-10-12 HUMAN FACTORS ENGINEERING	W83-70406	199-60-11 HYPERSONIC AIRCRAFT	W83-70440	ER SEASAT Digital SAR Processing 677-48-01	W83-70545
Human Factors Facilities Operations		High Speed (Super/Hypersonic) Technology	W00 70000	Spatial Radar Image Registration	
505-35-01 Crew Cockpit Interface Technology	W83-70036	505-43-83 HYPERSONIC FLIGHT	W83-70082	677-48-03 IPL Upgrade Interactive Display/Virtual Ro	W83-70546 am
505-35-23 Piloted Simulation Technology	W83-70039	Experimental/Applied Aerodynamics 505-31-23	W83-70008	677-80-22 Image Processing Technology	W83-70550
505-35-31	W83-70040	High Speed (Super/Hypersonic) Technology	W83-70082	310-40-46	W83-70574
Rotorcraft Aeromechanics and Configuration: 505-42-11	W83-70064	505-43-83 Shuttle Upper Atmosphere Mass Spectron	meter (SUMS)	IMAGE RESOLUTION Thematic Mapper Simulator Land Resource	ces Studies in
Human Factors for Crew Interfaces in Space 506-57-27	W83-70192	506-63-37 High Resolution Accelerometer Package (HiRA	W83-70224 P) Experiment	Western Ecozones 677-21-26	W83-70515
Teleoperator and EVA Human Factors		Development	·	IMAGING TECHNIQUES	***************************************
506-57-29 Advanced Life Support Systems	W83-70193	506-63-43 HYPERSONIC FLOW	W83-70228	Ocean Advanced Studies 161-10-00	W83-70332
199-60-11 Advanced Life Support Systems	W83-70440	Computational and Analytical Fluid Dynamics 505-31-03	W83-70003	Development of Experiment and Hardware 188-38-51	W83-70371
199-60-12	W83-70441	HYPERSONIC VEHICLES Hypersonic Aeronautics Technology		Gamma Ray Astronomy	
Advanced Extravehicular Systems (Space Su 199-60-21	W83-70442	505-43-81	W83-70080	188-46-57 X-Ray Astronomy	W83-70386
Advanced Extravehicular Systems 199-60-22	W83-70443	Hypersonic Propulsion Integration Technology 505-43-82	W83-70081	188-46-59 Topographic Mapping Methods	W83-70387
Man-Machine Engineering Requirements		HYPERSONICS		677-43-17	W83-70540
Functional Interfaces	W83-70447	Thermo-Gasdynamic Test Complex 506-51-41	W83-70126	IMMOBILIZATION Cardiovascular Deconditioning	
Operations Support Computing Technology 310-40-26	W83-70571	HYPERVELOCITY IMPACT Hypervelocity Impact Resistance of Compo	site Materials	199-20-12 Muscle Atrophy	W83-70413
Human-to-Machine Interface Technology		506-53-27	W83-70134	199-20-42	W83-70419
310-40-37 HUMAN PERFORMANCE	W83-70572	Experimental Impact Cratering 153-08-40	W83-70304	IMMUNOLOGY General biomedical Research	
Advanced Space Structural Concepts 506-53-40	W83-70139	HYPODYNAMIA Biological Adaptation		199-20-92 IMPACT	W83-70428
Space Human Factors 506-57-21		199-40-32 Hypokinesia	W83-70433	Giotto Dust Impact Detection System (DIDS	
Manned Control of Remote Operations	W83-70189	Longitudinal Studies		156-03-07 IMPACT DAMAGE	W83-70323
506-57-23 Human Factors for Crew Interfaces in Space	W83-70190	199-10-22 Muscle Alterations	W83-70408	Composites for Airframe Structures 505-33-33	W83-70025
506-57-27	W83-70192	199-20-41 Muscle Atrophy	W83-70418	Experimental Impact Cratering	
Human Sehavior and Performance 199-20-82	W83-70427	199-20-42	W83-70419	153-08-40 IMPACT RESISTANCE	W83-70304
HUMAN REACTIONS Community Response to Noise		Biological Adaptation 199-40-32	W83-70433	Hypervelocity Impact Resistance of Comp 506-53-27	oosite Materials W83-70134
505-35-13	W83-70037	HYPOVOLEMIA Blood Alterations (Influence of Space flight	on the Blood	Thermal Protection Systems for Earth-To-Ort	oit STS
Human Behavior and Performance 199-20-82	W83-70427	and Blood-Forming Tissues)		506-53-33 IMPACT STRENGTH	W83-70137
HUMAN TOLERANCES		199-20-51	W83-70420	Fire Resistant Composites 505-33-31	W83-70023
Community Response to Noise 505-35-13	W83-70037	i.		Rotorcraft Airframe Systems	
HUMAN WASTES		•		505-42-23 IMPACT TESTS	W83-70065
Life Support Systems Technology Developme 506-64-37	ent W83-70240	ICE FILE Flight ExperimentsAnalysis and Suppor		Advanced Structural Analysis Methods 505-33-53	W83-70029
HUMIDITY Global Weather Research - Advanced	Moisture and	542-03-14	W83-70243	Hypervelocity Impact Resistance of Comp	osite Materials
Temperature Sounder (AMTS)		Experimental Impact Cratering 153-08-40	W83-70304	506-53-27 IMPINGEMENT	W83-70134
146-72-02 HYDROCARBON FUELS	W83-70259	Planetary Clouds Particulates and Ices	W83-70311	OTV Propulsion Performance and Plume (506-60-49	Characterization W83-70211
Burning Fundamentals & Heat Transfer	W02 70040	154-30-80 Cosmic Chemistry Aeronomy Comets Grains		IN-FUGHT MONITORING	1703-70211
505-31-42 HYDRODYNAMICS	W83-70012	154-75-80 ICE FORMATION	W83-70315	Shuttle Entry Air Data System (SEADS) 506-63-32	W83-70220
Formation Evolution and Stability of Pro- 153-01-60	to-Stellar Disks W83-70298	Rotorcraft-Operating Problems 505-42-32	W83,70055	Shuttle Infrared Leeside Temperature Sensing 506-63-34	g (SILTS)
.50 0. 50			%83-70066		W83-70221
I-18					

01 11 11 14 1 14 1 0 1 1	/ () (1440)	INCRADED LAGERS		1117777777777777	
Shuttle Upper Atmosphere Mass Spectr 506-63-37	w83-70224	INFRARED LASERS Stratospheric Research Balloon Laser In	City Conner	INTERFEROMETERS	
High Resolution Accelerometer Package (HiR		147-11-04	W83-70267	Advanced Radar Concepts and Systems Stu 677-29-18	W83-70526
Development	int / Expeniment	INFRARED PHOTOGRAPHY		INTERFEROMETRY	
506-63-43	W83-70228	Test Methods and Instrumentation		Remote Sensing	
INCIDENCE		505-31-51	W83-70013	153-07-40	W83-7030
New Techniques for Quantitative Analysis		INFRARED RADIOMETERS Pressure Modulator Radiometer		Digital Topographic Mapping	g Mission
677-46-02	W83-70543	147-12-08	W83-70272	Requirements/Feasibility Study 677-29-12	W83-7052
INCINERATORS Waste Management for CELSS		SMIRR Data Analysis			
199-60-52	W83-70445	677-41-19	W83-70534	Digital Topographic Mapping Requirements/Feasibility Study	g Mission
INDEPENDENT VARIABLES	1103-70443	INFRARED SCANNERS	(01.70)	677-29-12	W83-7052
Solar Physics Data Analysis and Operations		Shuttle Infrared Leeside Temperature Se 506-63-34	w83-70221	INTERFERON	
385-38-01	W83-70460	Multisensor Technique Development	VV03-70221	General biomedical Research	
INDIUM ARSENIDES		677-21-28	W83-70516	199-20-92	W83-7042
Electronics Research and Technology		INFRARED SPECTRA		INTERNATIONAL COOPERATION	
506-54-15	W83-70150	Meteorological Observing System Develop		International Halley Watch	14/00 7004
INDUSTRIES		146-70-00	W83-70256	156-02-02	W83-7031
Commercial Materials Processing in Low-Gr 179-60-62	avity W83-70362	Stratospheric Fourier Spectroscopy at Wavelengths	Near and Mid IR	Cosmos Flight Experiments Project 199-70-12	W83-7044
INFECTIOUS DISEASES	VV83-70302	147-12-05	W83-70270	Hydrologie Information Extraction Techniq	
General biomedical Research		Atomic and Molecular Properties of Pla		677-22-27	W83-7051
199-20-92	W83-70428	Constituents	• •	INTERNATIONAL SUN EARTH EXPLORER 3	
INFORMATION		154-50-80	W83-70313	Solar and Heliospheric Physics Data Analys	
Curation of Extraterrestrial Samples		Climate Observations	14/02 70404	385-38-01	W83-7046
152-04-40	W83-70296	672-40-00 Improved Rock Type Discrimination	W83-70494	INTERPLANETARY DUST	
INFORMATION DISSEMINATION		677-41-03	W83-70529	Cosmic Chemistry Aeronomy Comets Gra	
Chemical Propulsion R&T Interagency Suppl	ort W83-70205	High Spectral Resolution Techniques for		154-75-80	W83-7031
506-60-10	VV83-70205	677-41-14	W83-70531	Solar System Environments 199-50-42	W83-7043
Assessment of Ozone Perturbations	W83-70290	INFRARED SPECTROMETERS			VV83-7043
JSC General Operations - Geophysics & Ge		Stratospheric Fourier Spectroscopy at	t Near and Mid IR	INTERPLANETARY SPACE Data Analysis	
153-10-40	W83-70307	Wavelengths 147-12-05	W83-70270	385-38-01	W83-7045
International Halley Watch		Laser Laboratory Spectroscopy		INTERPLANETARY SPACECRAFT	
156-02-02	W83-70318	147-23-09	W83-70282	Conceptual Characterization and Technol	
MPS AR&DA Support		Atomic and Molecular Properties of Pla		506-63-29	W83-7021
179-40-62	W83-70360	Constituents	14/00 3000	INTERPOLATION	
Commercial Materials Processing in Low-Gr		154-50-80	W83-70313	Upper Atmosphere Research - Satellite Date	
179-60-62	W83-70362	Planetary Instrument Development P Astronomy	rogram/Planetary	147-41-00	W83-7028
INFORMATION MANAGEMENT Aerospace Computer Science University Res	tearch	157-05-50	W83-70328	INTERSTELLAR CHEMISTRY Cosmic Chemistry Aeronomy Comets Gra	une
505-37-20	W83-70051	INFRARED SPECTROSCOPY		154-75-80	W83-7031
Space Computer Science University Research	ch	Quantitative Infrared Spectroscopy of M	inor Constituents of	Chemical Evolution	
506-54-50	W83-70158	the Earth's Stratosphere	14100 70070	199-50-12	W83-7043
INFORMATION SYSTEMS		147-20-03 Infrared Laboratory Spectroscopy in Supp	W83-70276	Research in Astrophysics at the Goddard In	stitute for Space
Oceanic Pilot System 656-13-40	W83-70479	Measurements	port of Stratospheric	Studies and Columbia University 405-02-02	W83-7046
Information Sciences Research and Develop		147-23-08	W83-70281	INTERSTELLAR COMMUNICATION	VV03-70 - 0
656-30-01	W83-70481	Kinetic Studies Involving CH302 HO2	and IO Radicals of	The Search for Extraterrestrial Intelligence	
Advanced Technology Global Resources Ne		Tropospheric Importance		199-50-62	W83-7043
656-44-,06	W83-70485	176-30-01	W83-70351	INTERSTELLAR MATTER	
INFRARED ASTRONOMY		Ground-Based Infrared Astronomy 196-41-50	W83-70394	Cosmic Chemistry Aeronomy Comets Gra	
Far Infrared Detectors and Cooled Research 506-54-21	W83-70153	Advanced Infrared Astronomy and Labo		154-75-80 UV and Optical Astronomy	W83-7031
Infrared and Sub-Millimeter Astronomy	1100 70100	196-41-54	W83-70396	188-41-51	W83-7038
188-41-55	W83-70382	Planetary Astronomy and Supporting L	aboratory Research	Chemical Evolution	
Ground-Based Infrared Astronomy		196-41-67	W83-70397	199-50-12	W83-7043
196-41-50	W83-70394	Optical Astronomy	14/02 70200	INTRAVEHICULAR ACTIVITY	
Planetary Infrared Imaging	W07 70400	196-41-71 INFRARED TELESCOPES	W83-70399	Human Factors for Crew Interfaces in Space	ce W83-7019
196-41-77 Data Analysis Astronomy	W83-70403	Far Infrared Detectors and Cooled Resea	arch	506-57-27 INVENTORIES	W83-7019
385-41-01	W83-70463	506-54-21	W83-70153	Land Use and Techniques for Monitoring Lar	ge Scale Chanc
Research in Astrophysics at the Goddard Ins		Infrared Imagery of Shuttle		in Biomass	go court
Studies and Columbia University		506-63-35	W83-70222	677-21-30	W83-7051
405-02-02	W83-70465	INLET AIRFRAME CONFIGURATIONS Supersonic Propulsion Integration Techn	alamı	INVENTORY MANAGEMENT	
INFRARED ASTRONOMY SATELLITE Research in Astrophysics at the Goddard Ins	stitute for Conce	505-43-42	W83-70077	Flight Support 533-02-91	W83-7011
Studies and Columbia University	stitute to: Space	Hypersonic Propulsion Integration Techn		INVERTEBRATES	1103/1011
405-02-02	W83-70465	505-43-82	W83-70081	Biological Adaptation	
INFRARED DETECTORS		INLET FLOW		199-40-32	W83-7043
Far Infrared Detectors and Cooled Research		Inlets and Nozzles	1400 70055	10	
506-54-21	W83-70153	505-40-02	W83-70055	Planetary Geology	W00 7000
Infrared Imagery of Shuttle 506-63-35	W83-70222	INLET NOZZLES Inlets and Nozzles		151-01-70 Optical Astronomy	W83-7029
Global Weather Research - Advanced		505-40-02	W83-70055	196-41-71	W83-7039
Temperature Sounder (AMTS)		Supersonic Propulsion Integration Techn		ION PLATING	
146-72-02	W83-70259	505-43-42	W83-70077	Electrically Conductive Thermal Control Coa	
Remote Sensing of Atmospheric Structure 154-40-80	W83-70312	INSTRUMENT ERRORS		506-53-26 ION PROPULSION	W83-7013
Research in Astrophysics at the Goddard Ins		Critical Examination of Upper Stratosph		Flight Test of an Ion Auxiliary Propulsion	n System (IAPS
Studies and Columbia University	titute to opace	147-43-00	W83-70288	542-05-12	W83-7024
405-02-02	W83-70465	DASIBI Measurement of Ozon	e Profile and	ION SOURCES	
Multispectral Linear Array for Remote Sensi		Column-Content 673-11-00	W83-70498	Giotto particulate Impact Analyzer (PIA)	Co-Investigate
677-27-01	W83-70520	Correlative Measurement Improvements	1103-70430	Support	3000
INFRARED IMAGERY	h	673-18-00	W83-70502	156-03-04	W83-7032
Computational and Experimental Aerotherod 506-51-11	W83-70123	INSTRUMENT LANDING SYSTEMS		Giotto Ion Mass Spectrometer Co-Investiga	stor Support
Infrared Imagery of Shuttle	1103 70123	Rotorcraft Flight Guidance Systems Tech	nnology	156-03-03	W83-7032
506-63-35	W83-70222	532-01-11	W83-70094	IONIZATION	
Land Resources Applied Research		INSTRUMENT PACKAGES		Electrically Conductive Thermal Control Coa	
677-21-29	W83-70517	Space Station Resource Observations Pa		506-53-26	W83-7013
Geobotanical Mapping in the Eastern United 677-42-07	1 States W83-70538	677-29-14	W83-70524	Research of the use of Space Resources 179-46-20	W83-7036
INFRARED INSTRUMENTS	***********	INTAKE SYSTEMS Computational Fluid Dynamics for Turbo	machinery	X-Ray Astronomy CCD Instrumentation Dev	
Infrared Experiment Development		505-31-02	w83-70002	188-46-59	W83-7038
157-04-80	W83-70325	INTEGRATED CIRCUITS		IONIZING RADIATION	
INFRARED INTERFEROMETERS	- 10-	Network Software Design Technology		Radiation Effects and Protection	14:00 55:5
Infrared Laboratory Spectroscopy in Support	of Stratospheric	310-40-72	W83-70576	199-20-71	W83-7042
Measurements 147-23-08	W83-70281	INTEGRATED OPTICS		Biological Effects of Particle Radiation 199-20-72	W83-7042
Remote Sensing	1103-70201	Solid State & Optical Device Research		Developmental Biology	.,03-7042
153-07-40	W83-70303	506-54-13	W83-70149	199-40-22	W83-7043
Atomic and Molecular Properties of Planeta		Acousto-Optic & Submillimeter Device T		IONOSPHERE	
Constituents		506-54-16	W83-70151	Planetary Aeronomy Theory and Analysis	
154-50-80	W83-70313	INTELLIGENCE Life in the Universe		154-60-80	W83-7031
Planetary Instrument Development Pro Astronomy	gram/ Planetary	199-50-52	W83-70438	Extended Atmospheres 154-80-80	W83-7031
157-05-50	W83-70328	INTERFACES		IPAD	
Planetary Astronomy and Supporting Labo	ratory Research	Advanced Extravehicular Systems (Space		Computer-Aided Design	
196-41-67	W83-70397	199-60-21	W83-70442	505-37-13	W83-7005

IRON ALLOYS Experimental Magnetism	Land Cover Multisensor Analysis 677-21-25 W83-70514	LASER SPECTROSCOPY Computational Flame Radiation Research
153-08-50 W83-70305	Land Use and Techniques for Monitoring Large Scale Change	505-31-41 W83-70011
IRRADIANCE Development of Experiments and Hardware for Solar Physics	in Biomass	Electronics Research and Technology 506-54-15 W83-70150
Research	677-21-30 W83-70518 LANDING AIDS	Cosmic Chemistry Aeronomy Comets Grains
188-38-51 W83-70370 Global Climate Model Development and Applications	Aircraft Landing Dynamics	154-75-80 W83-70315 Development of Resonant Ionization Laser Spectroscopy for
672-30-00 W83-70493	505-45-23 W83-70092 LANDING GEAR	Tropospheric NOx Measurements
Thematic Mapper Simulator Land Resources Studies in Western Ecozones	Aircraft Landing Dynamics	176-40-03 W83-70352 Advanced Infrared Astronomy and Laboratory Astrophysics
677-21-26 W83-70515	505-45-23 W83-70092	196-41-54 W83-70396
IRRADIATION	LANDSAT D Multisensor Technique Development	LASERS
Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135	677-21-28 W83-70516	High Resolution Laser Research 506-54-23 W83-70154
IRRIGATION	Land Resources Applied Research 677-21-29 W83-70517	Sensor Research and Technology 506-54-26 W83-70156
Digital Mapping of Irrigated Cropland 677-60-11 W83-70547	677-21-29 W83-70517 Chromite Test Case Study	506-54-26 W83-70156 Advanced Radiant Energy Conversion
ISOTOPES	677-41-17 W83-70533	506-55-13 W83-70166
Studies of the Distribution of Elements and Mineral Phases Among Meteorites	LANDSAT SATELLITES Digital Mapping of Irrigated Cropland	Laser Laboratory Spectroscopy 147-23-09 W83-70282
152-03-60 W83-70295	677-60-11 W83-70547	Communications Systems Technology Development
ITERATIVE SOLUTION Computational and Analytical Fluid Dynamics	LARGE SCALE INTEGRATION Advanced Technological Development General Signal and	310-20-67 W83-70567 LAUNCH VEHICLES
505-31-03 W83-70003	Data Processing Electronics Solid State Detectors	Advanced Carbon-Carbon Panels
	188-78-51 W83-70393	506-53-37 W83-70138 Technology Requirements for Advanced Space Transportation
J	Satellite Switching and Processing Systems 650-60-21 W83-70475	Systems
_	High-Speed Signal Processing Research	506-63-23 W83-70216 Advanced Transportation Shuttle Derived Vehicles (SDV)
JET AIRCRAFT NOISE Aeroacoustics Research	310-30-70 W83-70570 Network Software Design Technology	906-65-00 W83-70589
505-31-33 W83-70010	310-40-72 W83-70576	LAUNCHING SITES
JET EXHAUST Aeroacoustics Research	LARGE SPACE STRUCTURES Advanced Space Structural Concepts	High Energy Upper Stage 906-63-00 W83-70582
505-31-33 W83-70010	506-53-40 W83-70139	Advanced Space Transportation Systems Ground
JET LIFT	Advanced Space Structures 506-53-43 W83-70140	Operations 906-64-21 W83-70585
Geodynamics/Flight Dynamics of Powered Lift Vehicles 505-43-01 W83-70068	Advanced Space Structures Antenna Technology	Ground Operations Associated with Special Flight
High-Speed Aerodynamics and Propulsion Integration	Development 506-53-45 W83-70141	Demonstrations 906-64-23 W83-70587
505-43-23 W83-70073 Propulsive-Lift Technology - QSRA Flight Experiments	506-53-45 W83-70141 Analysis and Design	LEADING EDGES
533-02-50 W83-70106	506-53-53 W83-70143	F-4 Spanwise Blowing 533-02-33 W83-70104
Program Program Program	Payloads Definition Methods 506-53-56 W83-70145	LEUKOCYTES
533-02-51 W83-70107	Electric Propulsion Technology	Blood Alterations (Influence of Space flight on the Blood and Blood-Forming Tissues)
JOINTS (JUNCTIONS) Composites for Airframe Structures	506-55-22 W83-70168 Spacecraft Controls and Guidance	199-20-51 W83-70420
505-33-33 W83-70025	506-57-13 W83-70185	LEVITATION Containerless Processing
Structural Integration 534-03-13 W83-70116	Advanced Control Technology 506-57-15 W83-70186	179-80-30 W83-70364
JOURNAL BEARINGS	Large Space Systems Technology Control and Guidance	LIFE (DURABILITY) Life Prediction Fatigue Damage and Environmental Effects
Tribological Experiments in Zero Gravity 542-03-27 W83-70245	506-57-19 W83-70188 Multiple Beam Antenna Technology Development Program	in Metals and Composites
JUPITER (PLANET)	for Large Aperture Deployable Reflectors	505-33-21 W83-70020 Life Prediction for Structural Materials
Remote Sensing of Atmospheric Structure 154-40-80 W83-70312	506-58-23 W83-70201 Study of Large Deployable Reflector for Infrared and	505-33-23 W83-70022
Planetary Aeronomy Theory and Analysis	Submillimeter Astronomy	Composites for Airframe Structures 505-33-33 W83-70025
154-60-80 W83-70314 Planetary Infrared Imaging	506-62-21 W83-70212 Advanced Large Spacecraft Systems Analysis	Advanced Technological Development General Signal and
196-41-77 W83-70403	506-62-23 W83-70213	Data Processing Electronics Solid State Detectors 188-78-51 W83-70393
JUPITER RINGS Planetary Infrared Imaging	Solar Array Flight Experiment (SAFE) Dynamics & Control Augmentation (Flights 1 and 2)	LIFE CYCLE COSTS
196-41-77 W83-70403	506-62-49 W83-70215	Space Station Communication Technology 506-58-27 W83-70204
	Space Station Propulsion Requirements 506-64-12 W83-70229	Earth-to-Orbit Propulsion Life and Performance Technology
K	Shuttle Operational Flight Test of a Large Solar Array	506-60-12 W83-70206 Technology Systems Analysis Across Disciplines for
	542-03-04 W83-70242 Structural Assembly Demonstration Experiment (SADE)	Permanently Orbiting Space Stations
KEVLAR (TRADEMARK) Rotorcraft Airframe Systems	906-55-00 W83-70580	506-64-13 W83-70230 Station Monitor and Control Technology
505-42-23 W83-70065	Orbital Services 906-75-00 W83-70592	310-20-68 W83-70568
KIDNEYS Fluid and Electrolyte Change	Deployable Antenna Flight Experiment	UFE DETECTORS
199-20-61 W83-70422	906-90-00 W83-70594 LARGE SPACE TELESCOPE	The Search for Extraterrestrial Intelligence 199-50-62 W83-70439
KINEMATICS Advanced Large Spacecraft Systems Analysis	Teleoperations and Cryogenic Fluid Management	LIFE SPAN
506-62-23 W83-70213	506-64-29 W83-70238 Application of Digital Image Processing Techniques to	Biological Effects of Particle Radiation 199-20-72 W83-70425
KINETIC FRICTION Tribological Experiments in Zero Gravity	Astronomical Imagery	LIFE SUPPORT SYSTEMS
542-03-27 W83-70245	385-41-01 W83-70462 LASER ALTIMETERS	Automations Technology for Manned Space Systems 506-54-67 W83-70164
	Digital Topographic Mapping Mission	Space Station Life Support Technology
L	Requirements/Feasibility Study 677-29-12 W83-70522	506-64-31 W83-70239 Life Support Systems Technology Development
_	Digital Topographic Mapping Mission	506-64-37 W83-70240
LABORATORIES JSC General Operations Support - Planetary Materials	Requirements/Feasibility Study 677-29-12 W83-70523	Operational Laboratory Support 199-10-11 W83-70405
152-05-40 W83-70297	Topographic Mapping Methods	Advanced Life Support Systems
JSC General Operations - Geophysics & Geochemistry 153-10-40 W83-70307	677-43-17 W83-70540 LASER APPLICATIONS	199-60-11 W83-70440 Advanced Life Support Systems
LAMINAR BOUNDARY LAYER	Propulsion Instrumentation	199-60-12 W83-70441
Boundary-Layer Stability and Transition Research 505-31-15 W83-70006	505-31-52 W83-70014 Photophysics and Optical Information Processing	Ames Research Center Initiatives 199-90-72 W83-70457
LAMINATES	506-54-11 W83-70147	Manned Facilities
Life Prediction Fatigue Damage and Environmental Effects in Metals and Composites	Archival Mass Memory	906-54-00 W83-70578 LIFT DRAG RATIO
505-33-21 W83-70020	506-58-10 W83-70194 Stratospheric Research Balloon Laser In-Situ Sensor	Supersonic Aerodynamics Configurations, Integration
LAND MOBILE SATELLITE SERVICE Technical Consultation Services	147-11-04 W83-70267	Structures & Materials Technology 505-43-43 W83-70078
643-10-01 W83-70466	Geological Applications of New Remote Sensing Techniques	LIGHT (VISIBLE RADIATION)
New Application Studies	677-41-23 W83-70535	Acvive and Passive Sensor Research
643-10-02 W83-70468 Communications Satellite New Application Notification	LASER DOPPLER VELOCIMETERS Test Methods and Instrumentation	LIGHT CURVE
Studies	505-31-51 W83-70013	Giotto Halley Modeling
	LASER SPECTROMETERS	156-03-01 W83-70319 LIGHT MODULATION
643-10-02 W83-70469 Mobile Satellite Experiment	Laser Laboratory Spectroscopy	
643-10-02 W83-70469 Mobile Satellite Experiment 650-60-00 W83-70473	Laser Laboratory Spectroscopy 147-23-09 W83-70282	Programmable Mask Technology
643-10-02 W83-70469 Mobile Satellite Experiment	147-23-09 W83-70282 Atomic and Molecular Properties of Planetary Atmospheric	Programmable Mask Technology 506-54-17 W83-70152 LIGHTMING
643-10-02 W83-70469 Mobile Satellite Experiment 650-60-00 W83-70473 LAND USE Community Response to Noise 505-35-13 W83-70037	147-23-09 W83-70282 Atomic and Molecular Properties of Planetary Atmospheric Constituents 154-50-80 W83-70313	506-54-17 W83-70152 LIGHTNING Aviation Safety Severe Storm Hazards
643-10-02 W83-70469 Mobile Satellite Experiment 650-60-00 W83-70473 LAND USE Community Response to Noise	147-23-09 W83-70282 Atomic and Molecular Properties of Planetary Atmospheric Constituents	506-54-17 W83-70152 LIGHTNING

Planetary Clouds Particulates and Ices 154-30-80 W83-70	LOW LEVEL TURBULENCE		MAGNETOMETERS
LIGHTNING SUPPRESSION	311 Aircraft Landing Dynamics 505-46-23 LOW SPEED WIND TUNNELS	W83-70092	Ground-Based Observations of the Sun 188-38-52 W83-70373
Aviation Safety Severe Storm Hazards 505-45-03 W83-70	085 Wind Tunnel Operations	14/00 70000	Geopotential Research Mission (GRM) GRAVSAT/MAGSAT Studies
LINE SPECTRA Quantitative Infrared Spectroscopy of Minor Constituen	505-40-72 is of LOW THRUST PROPULSION	W83-70063	676-59-10 W83-70509 MAGNETOPLASMADYNAMICS
the Earth's Stratosphere 147-20-03 W83-70	Advanced Low Thrust Chemical Prop	ulsion Technology W83-70209	Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169
Infrared Laboratory Spectroscopy in Support of Stratosp	veric Variable Thrust OTV Propulsion Technolog 506-60-42	y W83-70210	MAGNETOSPHERE Extended Atmospheres
Measurements 147-23-08 W83-70	281 LOWER ATMOSPHERE Meteorological Lidar Development		154-80-80 W83-70317 Space Plasma Data Analysis
Laser Laboratory Spectroscopy 147-23-09 W83-70	146-74-01	W83-70263	385-36-01 W83-70458
Millimeter/Submillimeter Laboratory Spectroscopy 147-23-10 W83-70	Crew Health Maintenance	14/02 70410	MAGSAT SATELLITES Crustal Magnetic Field Representation and Verification
Advanced Infrared Astronomy and Laboratory Astroph	rsics Cardiovascular Deconditioning (JSC)	W83-70410	677-45-06 W83-70542 MAINTAINABILITY
196-41-54 W83-70 Planetary Astronomy and Supporting Laboratory Rese	arch LUBRICATION	W83-70412	Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135
196-41-67 W83-70 Optical Astronomy	397 High Temperature Materials 505-33-12	W83-70018	Advanced Carbon-Carbon Panels 506-53-37 W83-70138
196-41-71 W83-70	505-40-42	W83-70059	Frequency and Timing Research 310-10-62 W83-70558
Intercomparison of Dobson and Interferom Spectrometer	Non-Destructive Evaluation and Tribology	W83-70128	MAINTENANCE
673-13-00 W83-70	Tribological Experiments in Zero Gravity		AIRLAB Operations 505-34-23 W83-70035
Attitude Tracker Feasibility Study 677-29-17 W83-70	542-03-27 LUBRICATION SYSTEMS	W83-70245	Human Factors Facilities Operations 505-35-01 W83-70036
LINEAR POLARIZATION	542-03-27	W83-70245	Computational Facilities 505-37-32 W83-70054
X-Ray Astronomy 188-46-59 W83-70	388 Luminescence Detector from Space		Engine Systems Facilities Operations 505-40-70 W83-70062
LINEAR PROGRAMMING OEX-Advanced Autopilot	677-29-22	W83-70527 Remote Sensing	Wind Tunnel Operations 505-40-72 W83-70063
506-63-42 W83-70		W83-70535	High-Speed Wind Tunnel Operations
LININGS Turbine Engine Hot Section Technology (HOST)	LUNAR BASES	W83-70535	505-43-61 W83-70079 Spacecraft System Technology
533-04-12 W83-70	153-06- 4 0	W83-70302	506-64-15 W83-70231 Software Technology
Programmable Mask Technology 506-54-17 W83-70	LUNAR CRUST 152 Early Crustal Genesis		310-10-23 W83-70554 Station Monitor and Control Technology
LIQUID OXYGEN Earth-to-Orbit Propulsion Life and Performance Technology	153-09-40	W83-70306	310-20-68 W83-70568 MAMMALS
506-60-12 W83-70	.097	tical Studies W83-70294	Mammalian Development Facility
Reusable High Pressure Main Engine Technology 506-60-19 W83-76		Seochemistry	199-80-62 W83-70455 MAN ENVIRONMENT INTERACTIONS
LIQUID PHASE EPITAXY Solar Cell Research	LUNAR ROCKS	W83-70307	Climate Modeling with Emphasis on Aerosols 146-10-04 W83-70249
506-55-43 W83-70 LIQUID PROPELLANT ROCKET ENGINES	506-53-17	W83-70130	Upper Atmosphere Research - Theoretical Studies 147-31-00 W83-70285
Earth-to-Orbit Propulsion Life and Performance Technology 506-60-12 W83-70		W83-70296	Global Ecology 199-30-31 W83-70430
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 W83-76	logy LUNAR SOIL		Land Use and Techniques for Monitoring Large Scale Change in Biomass
Variable Thrust OTV Propulsion Technology	506-53-17	W83-70130	677-21-30 W83-70518
506-60-42 W83-70 LIQUID ROCKET PROPELLANTS	210 Planetary Materials Analysis 152-01-40		MAN MACHINE SYSTEMS
		W83-70293	Flight Simulation Technology
Advanced Manned Vehicle Onboard Propulsion Techno 506-60-17 W83-70	logy Curation of Extraterrestrial Samples 207 152-04-40	W83-70293 W83-70296	Flight Simulation Technology 505-35-33 W83-70041 AFTI/F-16
Advanced Manned Vehicle Onboard Propulsion Technol 506-60-17 W83-70 LITHIUM SULFUR BATTERIES	logy Curation of Extraterrestrial Samples		505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108
Advanced Manned Vehicle Onboard Propulsion Technol 506-60-17 W83-70 LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 W83-70	logy Curation of Extraterrestrial Samples 207 152-04-40 Chemical Evolution 199-50-12	W83-70296	505-35-33 W83-70041 AFTI/F-16 W83-70108 Automation Systems Research 506-54-63 W83-70161
Advanced Manned Vehicle Onboard Propulsion Technology LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 LITHOLOGY Improved Rock Type Discrimination	logy Curation of Extraterrestrial Samples 207 152-04-40 Chemical Evolution 199-50-12	W83-70296	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189
Advanced Manned Vehicle Onboard Propulsion Technology LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 LITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget	logy	W83-70296	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190
Advanced Manned Vehicle Onboard Propulsion Technol 508-60-17 W83-70 W83-	logy Curation of Extraterrestrial Samples 207 152-04-40 Chemical Evolution 199-50-12 1175 M MAGMA Research of the use of Space Resources 179-46-20	W83-70296	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator Human Interface Technology 506-57-25 W83-70191
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 W83-70 LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 W83-70 LITHOLOGY Improved Rock Type Discrimination 677-41-03 W83-70 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain	logy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M 529 sted MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution	W83-70296 W83-70434 W83-70361	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator Human Interface Technology
Advanced Manned Vehicle Onboard Propulsion Technology LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 LITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 LITHOSPHERE Global Ecology 199-30-31 W83-76	logy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES	W83-70296 W83-70434 W83-70361 W83-70507	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator Human Interface Technology 506-57-25 W83-70191 Human Factors for Crew Interfaces in Space 506-57-27 W83-70192 Teleoperator and EVA Human Factors
Advanced Manned Vehicle Onboard Propulsion Technol 508-60-17 W83-70 W83-	logy Curation of Extraterrestrial Samples 207 152-04-40 Chemical Evolution 199-50-12 IT75 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and	W83-70296 W83-70434 W83-70361 W83-70507	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator Human Interface Technology 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis
Advanced Manned Vehicle Onboard Propulsion Techno 508-60-17 W83-70 W83-7	logy Curation of Extraterrestrial Samples 207 152-04-40 Chemical Evolution 199-50-12 TM S29 Sted MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research	W83-70296 W83-70434 W83-70361 W83-70507 Verification W83-70542	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator Human Interface Technology 506-57-25 W83-70191 Human Factors for Crew Interfaces in Space 506-57-27 W83-70192 Teleoperator and EVA Human Factors 506-57-29 W83-70193 Teleoperator and Robotics System Analysis 506-64 23 Teleoperations and Cryogenic Fluid Management
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 W83-70 LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 W83-70 LITHOLOGY Improved Rock Type Discrimination 877-41-03 W83-70 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 W83-70 LITHOSPHERE Global Ecology 199-30-31 W83-70 Lithospheric Structure and Evolution 676-30-05 W83-70 LOAD TESTS Composites for Airframe Structures 505-33-33 W83-70 LONG DURATION EXPOSURE FACILITY	togy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 The state of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS	W83-70296 W83-70434 W83-70361 W83-70507	505-35-33 W83-70041 AFTI/F-16 533-02-61 W83-70108 Automation Systems Research 506-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator Human Interface Technology 506-57-25 W83-70191 Human Factors for Crew Interfaces in Space 506-57-27 W83-70192 Teleoperator and EVA Human Factors 506-57-29 W83-70193 Teleoperator and Robotics System Analysis 506-64-23 W83-70238 Man-Machine Engineering Requirements for Data and
Advanced Manned Vehicle Onboard Propulsion Technol 506-60-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain W83-70 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13	logy Curation of Extraterrestrial Samples 207 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials	W83-70296 W83-70434 W83-70361 W83-70507 Verification W83-70542	505-35-33 W83-70041 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 W83-70161 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-25 W83-70190 Teleoperator Human Interface Technology 506-57-25 W83-70191 Teleoperator and EVA Human Factors 506-57-27 W83-70192 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 Teleoperators and Cryogenic Fluid Management 506-64-29 W83-70238 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 W83-70447
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 W83-70 LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 W83-70 LITHOLOGY Improved Rock Type Discrimination 677-41-03 W83-70 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 W83-70 LITHOSPHERE Global Ecology 199-30-31 W83-70 Lithospheric Structure and Evolution 676-30-05 W83-70 LODA TESTS Composites for Airframe Structures 505-33-33 W83-70 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility Low Duration SPACE FLIGHT Inflight Medical Support	togy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 505 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets	W83-70296 W83-70434 W83-70361 W83-70507 Verification W83-70542 W83-70149	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37
Advanced Manned Vehicle Onboard Propulsion Technol 508-60-17 W83-70 LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-95-55 W83-70 LITHOLOGY Improved Rock Type Discrimination 677-41-03 W83-70 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 LITHOSPHERE Global Ecology 199-30-31 W83-70 Luthospheric Structure and Evolution 676-30-05 W83-70 LOAD TESTS Composites for Airframe Structures 505-33-33 W83-70 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT	logy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-4-1-52 MAGNETIC MATERIALS	W83-70296 W83-70434 W83-70361 W83-70507 S Verification W83-70142 W83-70149 W83-70130 W83-70395	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 W83-70193 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 W83-70234 W83-70234 W83-70234 W83-70234 W83-70238 W83-70447 Human-to-Machine Interface Technology 310-40-37 W83-70572 W83-70572
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 77-41-13 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 W83-76 Hospital Systems 199-20-32	togy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribu 506-55-17	W83-70296 W83-70434 W83-70361 W83-70507 S Verification W83-70142 W83-70149 W83-70130 W83-70395	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology - Goddard Support 105-60-26-26 W83-7052
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 COMD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-61 W83-76	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Retining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribu 506-55-72	W83-70296 W83-70434 W83-70361 W83-70507 9 Verification W83-70542 W83-70149 W83-70130 W83-70395	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology - Goddard Support 506-64-26 Software Technology 310-10-23 W83-70554
Advanced Manned Vehicle Onboard Propulsion Technologo-0-17 ILITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 ILITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 W83-76 ILITHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Flud and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 W83-76	togy Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribu 506-55-72 MAGNETIC MATERIALS Power Systems Management 188-38-52 MAGNETIC MEASUREMENT Ground-Based Observations of the Sun 188-38-52	W83-70296 W83-70434 W83-70361 W83-70507 9 Verification W83-70542 W83-70149 W83-70130 W83-70395	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperator and Robotics System Analysis 506-64-29 W83-70193 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 W83-70238 W83-70234 W83-70238 W83-70238 W83-70238 W83-70238 W83-70238 W83-70238 Space Fluid Management Technology 310-40-37 W83-70524 W83-70524 W83-70524 W83-70524 W83-70524 W83-70524 W83-70525 W83-70524 W83-70524 W83-70524
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 W83-70 W83-	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Retining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribu 506-55-72 MAGNETIC MATERIALS 196-55-72 MAGNETIC MATERIALS Toround-Based Observations of the Sun 188-38-52 MAGNETIC SIGNATURES Ground-Based Observations of the Sun	W83-70296 W83-70434 W83-70361 W83-70507 Verification W83-70542 W83-70149 W83-70130 W83-70395 tion W83-70179 W83-70373	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-34-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 ITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 W83-76 ITHOLOGY Improved Rock Type Discrimination 677-41-03 W83-76 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 W83-76 ITHOSPHERE Global Ecology 199-30-31 W83-76 Lithospheric Structure and Evolution 676-30-05 W83-76 LOAD TESTS Composites for Airframe Structures 505-33-33 W83-76 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 W83-76 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 W83-76 Bone Alterations 199-20-32 W83-76 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite Program Defin 199-80-42 Life Sciences Payload Accommodations 199-80-48	10gy	W83-70296 W83-70434 W83-70361 W83-70507 Verification W83-70542 W83-70149 W83-70130 W83-70395	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 506-54-63 Space Human Factors 506-57-21 W83-70189 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 W83-70193 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 W83-70234 W83-70234 W83-70234 W83-70234 W83-70234 W83-70238 W83-70573 W83-70573 W83-70554 W83-70554 W83-70554 W83-70553 W83-70553 W83-70553 W83-70553
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 678-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite Program Defin 199-80-42 Life Sciences Payload Accommodations	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-17 404 MAGNETIC MEASUREMENT Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun	W83-70296 W83-70434 W83-70361 W83-70507 I Verification W83-70149 W83-70130 W83-70395 tion W83-70373 W83-70373 W83-70373	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 W83-70193 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 W83-70234 W83-70238 W83-70554 W83-70554 W83-70554 W83-70554 W83-70553 W83-70553 W83-70553 W83-70553 W83-70573 W83-70553
Advanced Manned Vehicle Onboard Propulsion Technologo-0-17 LITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 LITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 W83-76 LITHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21	10gy	W83-70296 W83-70434 W83-70361 W83-70507 9 Verification W83-70149 W83-70130 W83-70179 W83-70373 W83-70373 W83-70374 Fields (Laboratory	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperatorian Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-26 MANEUVERS MANAGEMENT Highly Maneuverable Aircraft Technology Flight Research 533-03-11 MANEUVERS
Advanced Manned Vehicle Onboard Propulsion Technol 506-60-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LURD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-82 Long Duration Life Sciences Satellite 199-80-42 Life Sciences Payload Accommodations 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 W83-76	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 MAGMA Research of the use of Space Resources 179-46-20 Lithosphene Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribu 506-55-72 MAGNETIC MATERIALS Power Systems Management and Distribu 506-55-72 MAGNETIC MATERIALS 2427 MAGNETIC MATERIALS Power Systems Management of the Sun 188-38-52 MAGNETIC SIGNATURES Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION	W83-70296 W83-70434 W83-70361 W83-70507 I Verification W83-70149 W83-70130 W83-70395 tion W83-70373 W83-70373 W83-70373	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-34-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperator and Robotics System Analysis 506-64-29 W83-70193 Teleoperator and Robotics System Analysis 506-64-29 W83-70234 W83-70234 W83-70234 Teleoperatorial Interfaces 199-60-71 Human-to-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology Goddard Support 506-64-26 Software Technology 310-10-23 Mission Operations Technology 310-40-45 MANEUVERS Great Technology Flight Research W83-70114 MANEUVERS Ground Operations Associated with Special Flight
Advanced Manned Vehicle Onboard Propulsion Technol 506-60-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-61 Human Behavior and Performance 199-20-61 Long Duration Life Sciences Satellite 199-80-42 Life Sciences Payload Accommodations 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 Biological Effects of Particle Radiation 199-20-72 W83-76	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-17 MAGNETIC MATERIALS 407 MAGNETIC MATERIALS Power Systems Management of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-54 MAGNETIC SUSPENSION Experimental Test Techniques 505-31-53	W83-70296 W83-70434 W83-70361 W83-70507 9 Verification W83-70149 W83-70130 W83-70179 W83-70373 W83-70373 W83-70374 Fields (Laboratory	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-79 Teleoperator and Robotics System Analysis 506-64-23 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANACEMENT In-Space Fluid Management Technology 310-40-37 MANACEMENT In-Space Fluid Management Technology 310-40-26 Software Technology 310-40-25 MANACEMENT INFORMATION SYSTEMS Operations Support Computing Technology 310-40-26 MANACEMENT INFORMATION SYSTEMS OPERATION SYS
Advanced Manned Vehicle Onboard Propulsion Technic 506-80-17 IJTHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IJTHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IJTHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 678-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite Program Defin 199-80-42 Lufe Sciences Payload Accommodations 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 Biological Effects of Particle Radiation 199-20-72 Solar Physics Data Analysis and Operations 385-38-01	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-72 MAGNETIC MATERIALS 417 Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION Experimental Test Techniques 505-31-53 MAGNETIZATION Experimental Magnetism	W83-70296 W83-70434 W83-70361 W83-70507 V83-70149 W83-70130 W83-70130 W83-70373 W83-70373 W83-70373 W83-70374 Fields (Laboratory	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-10-23 Mission Operations Technology 310-40-45 MANAGEMENT INFORMATION SYSTEMS Operations Support Computing Technology 310-40-26 MANAGEMENT Heighly Maneuverable Aircraft Technology Flight Research 199-66-75-00 MANPUVERS Teleoperator Maneuvering System 906-75-00 MANIPULIATORS W83-70591 MANACEMENT Plight Research W83-70591 W83-70591
Advanced Manned Vehicle Onboard Propulsion Technic 506-60-17 IITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IITHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite Program Defin 199-80-42 Life Sciences Payload Accommodations 199-80-48 LONG TEREFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 Biological Effects of Particle Radiation 199-20-72 Solar Physics Data Analysis and Operations 385-38-01 DASIBI Measurement of Ozone 70-forlie	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-54-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-72 MAGNETIC MEASUREMENT Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION Experimental Test Techniques 505-31-53 MAGNETIZATION Experimental Magnetism 153-08-50	W83-70296 W83-70434 W83-70361 W83-70507 V83-70149 W83-70130 W83-70130 W83-70373 W83-70373 W83-70373 W83-70374 Fields (Laboratory	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-26 Mission Operations Technology 310-40-26 MANEUVERABILITY Highly Maneuverable Aircraft Technology Teleoperator Maneuvering System 906-64-23 Teleoperator Maneuvering System 906-64-23 Teleoperator Maneuvering System 906-64-23 Teleoperator Maneuvering System 906-64-23 Teleoperator Maneuvering System 906-65-00 MANIPULATORS Automation Technology for Planning Teleoperation and Robotics
Advanced Manned Vehicle Onboard Propulsion Technologo- 506-60-17 IITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IITHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 IOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite Program Defin 199-80-42 Life Sciences Payload Accommodations 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 Biological Effects of Particle Radiation 199-20-72 Solar Physics Data Analysis and Operations 385-38-01 DASIBI Measurement of Ozone W83-76 W83-76 W83-76 W83-76 W83-77 W83-77 W83-77 W83-78 W83-78 W83-79 W	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-72 MAGNETIC MEASUREMENT Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION Experimental Test Techniques 505-31-53 MAGNETIZATION Experimental Magnetism 153-08-50 MAGNETICHOPYDRODYNAMIC FLOW Extended Atmospheres	W83-70296 W83-70434 W83-70361 W83-70507 I Verification W83-70149 W83-70130 W83-70395 tion W83-70373 W83-70373 W83-70374 Fields (Laboratory W83-70375 W83-70015 W83-70305	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Teleoperator and EVA Human Factors 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-45 Software Technology 310-40-45 MANAGEMENT Highly Maneuverable Aircraft Technology Flight Research 533-03-11 MANEUVERS Ground Operations Associated with Special Flight Demonstrations 906-64-23 Teleoperator Maneuvering System 906-75-00 MANIPULATORS Automation Technology for Planning Teleoperation and
Advanced Manned Vehicle Onboard Propulsion Technol 506-60-17 ITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 ITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 ITHOSPHERE Global Ecology 199-30-31 Lithospheric Structure and Evolution 676-30-05 Long Duration Exposure Facility Low Duration Exposure Facility Low Duration Exposure Facility 1542-04-13 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-82 Long Duration Life Sciences Satellite 199-80-42 Long Duration Life Sciences Satellite 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 Biological Effects of Particle Radiation 199-20-72 Solar Physics Data Analysis and Operations 385-38-01 DASIBI Measurement of Ozone 70 Forbile 1673-11-00 W83-70 W83-7	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANOMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-17 404 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-17 MAGNETIC MEASUREMENT Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION Experimental Test Techniques 505-31-53 MAGNETICATION Experimental Magnetism 153-08-50 MAGNETIZATION Experimental Magnetism 153-08-50 MAGNETIZATION Experimental Magnetism 153-08-50 MAGNETIOHYDRODYNAMIC FLOW Extended Atmospheres 154-80-80 Space Plasma Data Analysis	W83-70296 W83-70434 W83-70361 W83-70507 Verification W83-70149 W83-70130 W83-70395 tion W83-70373 W83-70373 W83-70374 Fields (Laboratory W83-70375 W83-70015	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-45 Mission Operations Technology 310-40-26 MANEUVERSABILITY Highly Maneuverable Aircraft Technology Flight Research 230-67-500 MANIPULIATORS Automation Technology for Planning Teleoperation and Robotics 506-54-65 Teleoperator Human Interface Technology 306-75-25 MANAILUTAGRA W83-70591 MANPEUVERS Automation Technology for Planning Teleoperation and Robotics 506-54-65 Teleoperator Human Interface Technology 307-7014
Advanced Manned Vehicle Onboard Propulsion Technol 506-80-17 IITHIUM SULFUR BATTERIES Advanced Electrochemical Systems 506-55-55 IITHOLOGY Improved Rock Type Discrimination 677-41-03 Hydrothermal Ore System Detection in Partially Veget Mountainous Terrain 677-41-13 IITHOSPHERE Global Ecology 199-30-31 Inthospheric Structure and Evolution 678-30-05 LOAD TESTS Composites for Airframe Structures 505-33-33 LONG DURATION EXPOSURE FACILITY Low Duration Exposure Facility 542-04-13 LONG DURATION SPACE FLIGHT Inflight Medical Support 199-10-00 Bone Alterations 199-20-32 Fluid and Electrolyte Change 199-20-82 Fluid and Electrolyte Change 199-20-61 Human Behavior and Performance 199-20-82 Long Duration Life Sciences Satellite Program Defin 199-80-42 Life Sciences Payload Accommodations 199-80-48 LONG TERM EFFECTS Medical Operations Longitudinal Studies 199-10-21 Bone Loss 199-20-31 Biological Effects of Particle Radiation 199-20-72 Solar Physics Data Analysis and Operations 385-38-01 DASIBI Measurement of Ozone 79 (1961) Column-Content 673-11-00 LONG WAVE RADIATION 100 W83-70 LONG WAVE RADIATION 100 W83-70 LONG WAVE RADIATION 100 W83-70 LORENTZ FORCE	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 M MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-72 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-72 MAGNETIC MATERIALS 242 MAGNETIC MEASUREMENT Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION Experimental Magnetism 153-08-50 MAGNETICATION Experimental Magnetism 153-08-50 MAGNETION Experimental Magnetism 153-08-50 Space Plasma Data Analysis 385-36-01	W83-70296 W83-70434 W83-70361 W83-70507 I Verification W83-70149 W83-70130 W83-70395 tion W83-70373 W83-70373 W83-70374 Fields (Laboratory W83-70375 W83-70015 W83-70305	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperator and Robotics System Analysis 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-10-23 Mission Operations Technology 310-40-45 MANAGEMENT INFORMATION SYSTEMS Operations Support Computing Technology 310-40-26 MANEUVERABILITY Highly Maneuverable Aircraft Technology Flight Research 533-03-11 MANEUVERS Ground Operations Associated with Special Flight Demonstrations 906-64-23 Teleoperator Maneuvering System 906-75-00 MANIPULATORS Automation Technology for Planning Teleoperation and Robotics 506-57-25 Archival Mass Memory 506-58-10 W83-70194
Advanced Manned Vehicle Onboard Propulsion Technologo	Curation of Extraterrestrial Samples 152-04-40 Chemical Evolution 199-50-12 MAGMA Research of the use of Space Resources 179-46-20 Lithospheric Structure and Evolution 676-30-05 MAGNETIC ANDMALIES Crustal Magnetic Field Representation and 677-45-06 MAGNETIC DOMAINS Solid State & Optical Device Research 506-54-13 MAGNETIC FIELDS Refining of Nonterrestrial Materials 506-53-17 Imaging Studies of Comets 196-41-52 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-17 MAGNETIC MATERIALS Power Systems Management and Distribut 506-55-17 MAGNETIC MATERIALS Power Systems Management of the Sun 188-38-52 Ground-Based Observations of the Sun 188-38-52 Structure and evolution of Solar Magnetic & Theory for Solar Physics) 188-38-53 MAGNETIC SUSPENSION Experimental Test Techniques 505-31-53 MAGNETIZATION Experimental Magnetism 153-08-50 MAGNETIZATION Experimental Magnetism 153-08-50 MAGNETIZATION Experimental Magnetism 153-08-50 MAGNETOHYDRODYNAMICS Solar and Heliospheric Physics Data Analysis 385-36-01 MAGNETOHYDRODYNAMICS Solar and Heliospheric Physics Data Analysis	W83-70296 W83-70434 W83-70434 W83-70507 Verification W83-70149 W83-70130 W83-70179 W83-70373 W83-70373 W83-70375 W83-70375 W83-70015 W83-70305 W83-70317 W83-70458	505-35-33 AFTI/F-16 533-02-61 Automation Systems Research 505-54-63 Space Human Factors 506-57-21 Manned Control of Remote Operations 506-57-23 Teleoperator Human Interface Technology 506-57-25 Human Factors for Crew Interfaces in Space 506-57-27 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and EVA Human Factors 506-57-29 Teleoperator and Robotics System Analysis 506-64-23 Teleoperatorians and Cryogenic Fluid Management 506-64-29 Man-Machine Engineering Requirements for Data and Functional Interfaces 199-60-71 Human-to-Machine Interface Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology Goddard Support 506-64-26 Software Technology 310-40-37 MANAGEMENT In-Space Fluid Management Technology 310-40-45 MANAGEMENT W83-70554 MANAGEMENT Highly Maneuverable Aircraft Technology 310-40-26 MANEUVERABILITY Highly Maneuverable Aircraft Technology Teleoperator Maneuvering System 906-64-23 Teleoperator Maneuvering System 906-64-25 Teleoperator Maneuvering System 906-64-65 Teleoperator Human Interface Technology 506-57-25 Archival Mass Memory W83-70191

Teleoperator and EVA Human Factors 506-57-29	W83-70193	Computational Flame Radiation Research 505-31-41	W83-70011	MELTING Solidification Processes	
Radiation Effects and Protection		Mathematics for Engineering and Science		179-80-60	W83-70367
199-20-71 Human Behavior and Performance	W83-70424	505-31-83 Composites for Airframe Structures	W83-70016	MELTS (CRYSTAL GROWTH) Advanced Containerless Processing Techn	nology
199-20-82 Advanced Life Support Systems	W83-70427	505-33-33	W83-70025	179-20-55 Crystal Growth Processes	W83-70356
199-60-11	W83-70440	Engine Dynamics and Aeroelasticity 505-33-42	W83-70027	179-80-70	W83-70368
Advanced Life Support Systems 199-60-12	W83-70441	Aircraft Controls Theory and Applications 505-34-03	W83-70032	MEMBRANES Blood Alterations	
Interdisciplinary Research 199-90-71	W83-70456	Flight Simulation Technology 505-35-33	W83-70041	199-20-52 MERCURY ION ENGINES	W83-70421
Ames Research Center Initiatives 199-90-72		Computational Facilities		Flight Test of an Ion Auxiliary Propulsi	on System (IAPS) W83-70248
MAPPING	W83-70457	505-37-32 Fan and Compressor Research	W83-70054	542-05-12 MESOSCALE PHENOMENA	W83-70248
Multifunction SAR Technology 506-54-27	W83-70157	505-40-12 Combustors and Turbines	W83-70056	Physical Oceanography 161-20-00	W83-70335
Human Factors for Crew Interfaces in Space 506-57-27	W83-70192	505-40-22	W83-70057	Severe Storms and Local Weather Resear 175-13-00	ch W83-70346
Altimeter Time-Dependent Current Studies		Rotorcraft Aeromechanics and Configuration 505-42-11	W83-70064	Development of New Remote Da	
161-20-07 Digital Topographic Mapping	W83-70336 Mission	Operational Problems Fireworthiness and 0 505-45-11	Crashworthiness W83-70088	Techniques 175-20-00	W83-70347
Requirements/Feasibility Study 677-29-12	W83-70522	Aviation Safety Technology - Applied Fluid		Remote Sensor Development 175-40-00	W83-70348
Digital Topographic Mapping	Mission	Materials Modeling 505-45-15	W83-70089	MESOSPHERE	1100 70040
Requirements/Feasibility Study 677-29-12	W83-70523	Turbine Engine Hot Section Technology (HO 533-04-12	IST) W83-70115	Gas Correlation Wind Sensor 147-18-02	W83-70275
Use of SAR for Geologic Mapping 677-43-16	W83-70539	Entry Vehicle Aerothermodynamics 506-51-13	W83-70124	Stratospheric Research	W83-70284
Topographic Mapping Methods		Thermo-Gasdynamic Test Complex		Upper Atmosphere Research - Satellite Da	ata Analysis
677-43-17 Crustal Magnetic Field Representation and Ver	W83-70540 rification	506-51-41 Analysis and Design	W83-70126	147-41-00 Investigation of Upper Atmosphere Dynami	W83-70287 ics with Nimbus-7
677-45-06 MARINE BIOLOGY	W83-70542	506-53-53 Advanced Power System Technology	W83-70143	Satellite Data 673-31-00	W83-70503
Ocean Processes Branch Scientific Program St		506-55-76	W83-70181	METABOLISM	
161-50-02 MARINE ENVIRONMENTS	W83-70345	Spacecraft Controls and Guidance 506-57-13	W83-70185	Bone Alterations 199-20-32	W83-70417
Physical Oceanography 161-20-00	W83-70335	Advanced Control Technology 506-57-15	W83-70186	Biological Adaptation 199-40-32	W83-70433
Ocean Processes Branch Scientific Program St 161-50-02	upport	Meteorological Satellite Data Research		Organic Geochemistry 199-50-22	W83-70435
MARINE METEOROLOGY	W83-70345	146-60-00 Dynamics of Planetary Atmospheres	W83-70251	Advanced Life Support Systems	
Ocean Applications Development Program 161-30-01	W83-70340	154-20-80 Remote Sensing of Atmospheric Structure	W83-70309	199-60-11 METAL MATRIX COMPOSITES	W83-70440
MARINE RESOURCES Lidar and Acoustics Applications to Ocean		154-40-80	W83-70312	High Temperature Engine Composites 505-33-32	W83-70024
161-30-05	W83-70341	Giotto Ephemeris Support 156-03-02	W83-70320	Space Durable Composites and Thermat	Control Surfaces
MARINER PROGRAM Planetary Data Network Project		Giotto particulate Impact Analyzer (PIA) Support	Co-Investigator	506-53-29 METAL OXIDE SEMICONDUCTORS	W83-70135
656-80-01 MARS (PLANET)	W83-70489	156-03-04	W83-70322	Advanced Technological Development Ge Data Processing Electronics Solid State Det	
Planetary Clouds Particulates and Ices		Ocean Advanced Studies 161-10-00	W83-70332	188-78-51	W83-70393
154-30-80 Remote Sensing of Atmospheric Structure	W83-70311	Gulf of Mexico Circulation Studies 161-20-10	W83-70337	METAL SHELLS Spherical Shell Technology Study	
154-40-80 MARS ATMOSPHERE	W83-70312	Polar Oceanography	W83-70342	179-20-57 METAL SURFACES	W83-70358
Dynamics of Planetary Atmospheres		161-40-00 Oceanic Research Support Activities		Surface Physics and Computational Chem	istry
154-20-80 MARS SURFACE	W83-70309	161-50-00 Severe Storms and Local Weather Research	W83-70344	506-53-11 METAL VAPOR LASERS	W83-70127
Planetary Geology 151-01-70	W83-70292	175-13-00 Theoretical Studies of Galaxies Active Galai	W83-70346	Acvtive and Passive Sensor Research 506-54-25	W83-70155
MARS SURFACE SAMPLES		Quasi Stellar Objects		METALLIC GLASSES	
Chemical Evolution 199-50-12	W83-70434	188-41-53 Global Ecology	W83-70381	Spherical Shell Technology Study 179-20-57	W83-70358
MARSHLANDS Biosphere-Atmosphere Interactions in Wetland	d Ecosystems	199-30-31 Space Plasma Data Analysis	W83-70430	METALS Refining of Nonterrestrial Materials	
199-30-36 MASER OUTPUTS	W83-70431	385-36-01	W83-70458	506-53-17 METEORITE COLLISIONS	W83-70130
Precision Time and Frequency Sources		Data Analysis 385-38-01	W83-70459	Hypervelocity Impact Resistance of Co	
310-10-42 MASERS	W83-70556	Global Climate Model Development and App 672-30-00	olications W83-70493	506-53-27 METEORITE CRATERS	W83-70134
Radio Systems Development 310-20-66	W83-70566	DASIBI Measurement of Ozone	Profile and	Experimental Impact Cratering 153-08-40	W83-70304
MASS FLOW		Column-Content 673-11-00	W83-70498	METEORITES	
Experiment Development - Laboratory and The Physics	oretical Solar	Regional Crustal Deformation 676-10-10	W83-70506	Studies of the Distribution of Elements an Among Meteorites	
188-38-53 MASS SPECTROMETERS	W83-70376	MATRIX METHODS		152-03-60 Curation of Extraterrestrial Samples	W83-70295
Shuttle Upper Atmosphere Mass Spectrom		Computer-Aided Design 505-37-13	W83-70050	152-04-40	W83-70296
506-63-37 Giotto Ion Mass Spectrometer Co-Investigator		MEASURING INSTRUMENTS Experimental Test Techniques		Experimental Magnetism 153-08-50	W83-70305
156-03-03 Improvements in Neutral and Ion Mass Spectre	W83-70321	505-31-53	W83-70015	Chemical Evolution 199-50-12	W83-70434
157-04-80	W83-70326	Tropospheric Air Quality - Technology Devel	w83-70250	METEORITIC COMPOSITION	
	ction Rate	Ocean Advanced Studies 161-10-00	w83-70332	Planetary Materials Analysis 152-01-40	W83-70293
Measurements	W83-70277	MECHANICAL PROPERTIES		Planetary Materials Laboratory and Analy 152-02-40	tical Studies W83-70294
Planetary Materials Laboratory and Analytical	Studies	Research in Advanced Material Concepts 505-33-10	W83-70017	Studies of the Distribution of Elements an	
152-02-40 Improvements in Neutral and Ion Mass Spectro		High Temperature Materials 505-33-12	W83-70018	Among Meteorites 152-03-60	W83-70295
	W83-70326	Advanced Structural Alloys		Solar System Environments 199-50-42	W83-70437
Tropospheric Importance		505-33-13 High Temperature Engine Composites	W83-70019	METEORITIC DAMAGE	
176-30-01 Space Plasma Data Analysis	W83-70351	505-33-32 Composites for Airframe Structures	W83-70024	Hypervelocity Impact Resistance of Co 506-53-27	w83-70134
385-36-01	W83-70458	505-33-33	W83-70025	METEOROID SHOWERS Comets	
MASS TRANSFER Platform Systems Operations		Advanced Structural Analysis Methods 505-33-53	W83-70029	196-41-75	W83-70401
506-64-22	W83-70233	Supersonic Aerodynamics Configuration: Structures & Materials Technology	s Integration	METEOROIDS Hypervelocity Impact Resistance of Co	
MATERIALS RECOVERY Refining of Nonterrestrial Materials		505-43-43	W83-70078	506-53-27 METEOROLOGICAL FLIGHT	W83-70134
	W83-70130	Structural Integration 534-03-13	W83-70116	Tropospheric Air Quality - Technology Dev	velopment
Computational Methods and Applications	s in Fluid	MECHANIZATION Automation of Space Transportation System	s	146-20-10 METEOROLOGICAL INSTRUMENTS	W83-70250
Dynamics 505-31-01	W83-70001	506-63-27	W83-70217	Meteorological Observing System Develop 146-70-00	ment W83-70256
Computational Fluid Dynamics for Turbomachin	nery	Spacecraft System Technology 506-64-15	W83-70231	METEOROLOGICAL PARAMETERS	
Viscous Flows	W83-70002	MELT SPINNING High Temperature Materials		Advanced Microwave Sensing of Parameters	Meteorological
	W83-70004	505-33-12	'W83-70018 -	146-72-05	- W83-70261

Development of New Remote Data	Interpretation	Global Weather Research - Microwave		MODELS	
Techniques 175-20-00	W83-70347	146-72-01 Advanced Microwave Sensing of	W83-70258 of Meteorological	Early Crustal Genesis 153-09-40	W83-70306
Remote Sensor Development	14/02 70240	Parameters 146-72-05	W83-70261	Origin and Evolution of Life	
175-40-00 Variability and Trends in Stratospheric Ozor	W83-70348 ne the Middle	Physical Oceanography		199-50-32 MODEMS	W83-70436
Atmosphere and UV Solar Flux Variations	W83-70504	161-20-00 Ocean Optics	W83-70335	Mobile Satellite Experiment	
673-41-00 METEOROLOGICAL SATELLITES	W83-70504	161-30-00	W83-70339	650-60-00 MODULATION	W83-70473
Numerical Analysis of Remote Sensing Data	W83-70255	Ocean Applications Development Progra 161-30-01	w83-70340	Satellite Switching and Processing System	
146-66-01 METEOROLOGY	W83-70255	Advanced Radar Concepts and Systems 677-29-18	Study W83-70526	650-60-21 MOLECULAR BEAMS	W83-70475
Atmospheres and Climate Data Management		MICROWAVE SPECTROMETERS	W83-70526	Advanced Low Thrust Chemical Prog	
656-26-02 METHANE	W83-70480	High Resolution Laser Research 506-54-23	W83-70154	506-60-25 MOLECULAR CLOUDS	W83-70209
Biosphere-Atmosphere Interactions in Wetla 199-30-36		Millimeter/Submillimeter Laboratory Spe	ectroscopy	Research in Astrophysics at the Goddard	Institute for Space
MICHELSON INTERFEROMETERS	W83-70431	147-23-10 MICROWAVE TRANSMISSION	W83-70283	Studies and Columbia University 405-02-02	W83-70465
Upper Atmosphere Research - Field Measure 147-12-00	ments W83-70269	Communications TDRSS Follow-On 506-58-26		MOLECULAR COLLISIONS	1
Stratospheric Fourier Spectroscopy at Nei		X-Band Uplink Development	W83-70203	Research in Astrophysics at the Goddard Studies and Columbia University	
Wavelengths 147-12-05	W83-70270	310-20-64 Communications Systems Technology D	W83-70564	405-02-02	W83-70465
Ground-Based Infrared Astronomy		310-20-67	W83-70567	MOLECULAR INTERACTIONS Upper Atmosphere Research -	Reaction Rate
196-41-50 Intercomparison of Dobson and	W83-70394 Interferometric	MILLIMETER WAVES Communications TDRSS Follow-On	/Intersatellite Links	Measurements 147-21-00	W83-70277
Spectrometer		506-58-26	W83-70203	MOLECULAR ROTATION	
673-13-00 Microbiology	W83-70499	Global Weather Research - Microwave 146-72-01	W83-70258	Atomic and Molecular Properties of Plan Constituents	etary Atmospheric
Biosphere-Atmosphere Interactions in Wetla	nd Ecosystems W83-70431	Stratospheric Research, Field Meas Millimeter and Submillimeter Radiometry	urements Program	154-50-80	W83-70313
199-30-36 Organic Geochemistry		147-12-06	W83-70271	Radio Astronomy 196-41-73	W83-70400
199-50-22 MICROCHANNEL PLATES	W83-70435	Millimeter/Submillimeter Laboratory Spi 147-23-10	ectroscopy W83-70283	MOLECULAR SPECTRA	
Ultraviolet Detector Development		Radio Astronomy		Infrared Laboratory Spectroscopy in Suppo Measurements	ort of Stratospheric
188-41-24 MICROCOMPUTERS	W83-70379	196-41-73 MINERAL DEPOSITS	W83-70400	147-23-08	W83-70281
Computer-Aided Design		Hydrothermal Ore System Detection in	Partially Vegetated	Laser Laboratory Spectroscopy 147-23-09	W83-70282
505-37-13 Station Monitor and Control Technology	W83-70050	Mountainous Terrain 677-41-13	W83-70530	Millimeter/Submillimeter Laboratory Spec	
310-20-68	W83-70568	MINERAL EXPLORATION Chromite Test Case Study		147-23-10	W83-70283
MICRODENSITOMETERS Advanced Technology Image Digitization		677-41-17	W83-70533	MOLECULAR SPECTROSCOPY Photophysics and Optical Information Pro	cessing
656-60-10 MICROORGANISMS	W83-70488	Use of TM for the Detection of Minerali Terrain Through Inference of Geobotanical		506-54-11 Planetary Astronomy and Supporting La	W83-70147
Organic Geochemistry		677-42-04	W83-70536	196-41-67	W83-70397
199-50-22 MICROPROCESSORS	W83-70435	Remote Sensing Techniques for Geobota of Chromium-Bearing Rock Types	inical Discrimination	MOLECULAR STRUCTURE Fire Resistant Composites	
Mathematics for Engineering and Science		677-42-05 MINERALOGY	W83-70537	505-33-31	W83-70023
505-31-83 Controls and Instrumentation	W83-70016	Planetary Materials Laboratory and Ana	llytical Studies	MOLECULES Computational Flame Radiation Research	
505-40-52	W83-70060	152-02-40 Studies of the Distribution of Elements	W83-70294	505-31-41	W83-70011
Attitude/Orbit Technology 310-10-26	W83-70555	Among Meteorites		MOLYBDENUM Hydrothermal Ore System Detection in F	artially Vegetated
Human-to-Machine Interface Technology 310-40-37	W83-70572	152-03-60 Planetary Petrology	W83-70295	Mountainous Terrain 677-41-13	W83-70530
MICROSTRUCTURE	***************************************	153-02-40	W83-70299	MOMENTUM TRANSFER	***************************************
High Temperature Materials 505-33-12	W83-70018	Giotto particulate Impact Analyzer (PIA Support	A) Co-Investigator	Dynamics of Planetary Atmospheres 154-20-80	W83-70309
Advanced Structural Afloys		156-03-04 Improved Rock Type Discrimination	W83-70322	Dynamics of Planetary Atmospheres	
505-33-13 High Temperature Engine Composites	W83-70019	677-41-03	W83-70529	154-20-80 Extended Atmospheres	W83-70310
505-33-32 Non-Destructive Evaluation and Tribology	W83-70024	MINERALS Refining of Nonterrestrial Materials		154-80-80 MONSOONS	W83-70317
506-53-12	W83-70128	506-53-17	W83-70130	Altimeter Time-Dependent Current Studie	
MICROWAVE AMPLIFIERS Satellite Communications Research and Tech	nology	Experimental Magnetism 153-08-50	W83-70305	161-20-07 MOON	W83-70336
506-58-22	W83-70200	MINES (EXCAVATIONS) Land Resources Applied Research		Manned Lunar Base Study	
Deep Space and Advanced COMSAT Con Technology	mmunications	677-21-29	W83-70517	153-06-40 MOTION SICKNESS	W83-70302
506-58-25 RF Components for Satellite Communications	W83-70202	MIRRORS Study of Large Deployable Reflecto	r for Infrared and	Space Motion Sickness 199-20-21	W83-70414
650-60-22	W83-70476	Submillimeter Astronomy		Basic Mechanisms Underlying Space Mot	ion Sickness
Radio Systems Development 310-20-66	W83-70566	506-62-21 Advanced X-Ray Astrophysics Facility (A	W83-70212 (XAF)	199-20-22 Vestibular Research Facility (VRF)/Variable	W83-70415
MICROWAVE ANTENNAS		159-46-01 MISSILE CONFIGURATIONS	W83-70331	Facility (VGRF)	-
Advanced Large Spacecraft Systems Analysis 506-62-23	s W83-70213	High Speed (Super/Hypersonic) Technol		199-80-32 MOTION SICKNESS DRUGS	W83-70451
MICROWAVE FREQUENCIES RF Components for Satellite Communications	- Sustame	505-43-83 MISSILE DESIGN	W83-70082	Space Motion Sickness 199-20-21	W83-70414
650-60-22	W83-70476	High-Speed Aerodynamics and Propulsion		MOTION SIMULATORS	VV63-70414
Communications Laboratory for Transponder and Satellite Network Evaluation	r Development	505-43-23 MISSILE STRUCTURES	W83-70073	Piloted Simulation Technology 505-35-31	W83-70040
650-60-23	W83-70477	High Speed (Super/Hypersonic) Technol 505-43-83		Flight Simulation Technology	
MICROWAVE IMAGERY Hydrologic Information Extraction Technique	e Development	MISSILE TESTS	W83-70082	505-35-33 MOUNTAINS	W83-70041
677-22-27	W83-70519	Interagency & Industrial Assistance & Te 505-43-32	esting W83-70075	Hydrothermal Ore System Detection in P	artially Vegetated
MICROWAVE RADIOMETERS Clear Air Turbulence Studies Using Pass	ive Microwave	MISSILES		Mountainous Terrain 677-41-13	W83-70530
Radiometers 505-45-05	W83-70086	Interagency and Industrial Assistance an 505-43-33	d Testing W83-70076	MRKOS COMET Extended Atmospheres	
High Resolution Laser Research		MISSION PLANNING		154-80-80	W83-70317
506-54-23 Advanced Microwave Sensing of	W83-70154 Meteorological	Automation of Space Transportation Sys 506-63-27	W83-70217	MSAT Spectrum and Orbit Utilization Studies	
Parameters	-	STARPROBE - Advanced Technologi Planning	y Management &	643-10-01	W83-70467
146-72-05 Stratospheric Research Field Measureme	W83-70261 nts Program	188-78-38	W83-70390	Communications Satellite New Applic Studies	
Millimeter and Submillimeter Radiometry 147-12-06	W83-70271	Space Station Resource Observations Pa 677-29-14	ayload Study W83-70524	643-10-02 MULTIBEAM ANTENNAS	W83-70469
Gravitational Wave Astronomy and Cosmolog	39	Manned Facilities		Multiple Beam Antenna Technology Devi	elopment Program
188-41-22 MICROWAVE SCATTERING	W83-70378	906-54-00 Manned Facilities (Space Station)	W83-70578	for Large Aperture Deployable Reflectors 506-58-23	W83-70201
Coupled Active-Passive Sea Ice Analysis	14/92 70242	906-58-00 MITOCHONDRIA	W83-70581	MULTICHANNEL COMMUNICATION	
161-40-02 MICROWAVE SENSORS	W83-70343	Muscle Atrophy		Satellite Switching and Processing System 650-60-21	ns W83-70475
High Resolution Laser Research 506-54-23	W83-70154	199-20-42 MOBILITY	W83-70419	MULTIPLE BEAM INTERVAL SCANNERS Space Communications Systems Antenna	
Sensor Research and Technology		Advanced Extravehicular Systems (Space	e Suit)	650-60-20	W83-70474
506-54-26 Meteorological Observing System Developme	W83-70156 ent	199-60-21 Advanced Extravehicular Systems	W83-70442	MULTIPROCESSING (COMPUTERS) Space Computer Science University Reserved.	arch
146-70-00	W83-70256	199-60-22	W83-70443	506-54-50	W83-70158

MULTISPECTRAL BAND SCANNERS

MULTISPECTRAL BAND SCANNERS	auraan Studios in	NICKEL CADMIUM BATTERIES		Inlets and Nozzles 505-40-02	W83-7005
Thematic Mapper Simulator Land Resi Western Ecozones	ources Studies in	Advanced Electrochemical Systems 506-55-55	W83-70175	NOZZLE GEOMETRY	W63-7005
677-21-26	W83-70515	NICKEL HYDROGEN BATTERIES		F-4 Spanwise Blowing	
Land Resources Applied Research 677-21-29	W83-70517	Electrochemical Energy Conversion and Stora		533-02-33 NUCLEAR ELECTRIC PROPULSION	W83-7010
Improved Rock Type Discrimination	***************************************	506-55-52 Advanced Power System Technology	W83-70174	Electric Propulsion Thruster Subsystem R&1	Т
677-41-03	W83-70529	506-55-76	W83-70181	506-55-25	W83-7016
High Spectral Resolution Techniques for 677-41-14	Geologic Mapping W83-70531	NIMBUS 7 SATELLITE Spectroscopic Properties of the Stratosphere		NUCLEAR FUSION Gamma-Ray Astronomy	
Chromite Test Case Study		147-44-00	W83-70289	188-46-57	W83-7038
677-41-17	W83-70533	Ocean Applications Development Program		NUCLEATION	
Remote Sensing Techniques for Geobotani of Chromium-Bearing Rock Types	ical Discrimination	161-30-01	W83-70340	Glass Research 179-11-20	W83-7035
677-42-05	W83-70537	Solar Irradiance Rocket Experiment 672-40-08	W83-70495	Solidification Processes	***************************************
Remote Sensing Applications for Facility	Site Selection and	Absolute Solar Flux and Variability		179-80-60	W83-7036
Waste Disposal Impact Assessment 677-60-15	W83-70548	673-15-00	W83-70501	NUMERICAL ANALYSIS Computational Methods and Applicat	ions in Flui
MULTISPECTRAL LINEAR ARRAYS	W03-70546	Investigation of Upper Atmosphere Dynamics Satellite Data	with Nimbus-7	Dynamics Applications and Applications	.10115 117 1101
Renewable Resources Field Research and	Spacecraft Data	673-31-00	W83-70503	505-31-01	W83-7000
Analysis	14/82 20510	NITRIC OXIDE		Mathematics for Engineering and Science 505-31-83	W83-7001
677-21-24 Multispectral Linear Array for Remote Ser	W83-70513	Spectroscopic Properties of the Stratosphere 147-44-00	W83-70289	NUMERICAL CONTROL	W83-7001
677-27-01	W83-70520	Aircraft Borne LIDAR for O3 and OH Measu		Flight Control Concepts and Reliability Enha	
MUSCLES		673-14-00	W83-70500	505-34-01	W83-7003
Muscle Alterations 199-20-41	W83-70418	NITROGEN ISOTOPES		Control Theory and Methodology 505-34-02	W83-7003
Muscle Atrophy	1100 70410	Organic Geochemistry 199-50-22	W83-70435	Advanced Controls and Guidance	
199-20-42	W83-70419	NITROGEN OXIDES		505-34-11	W83-7003
MUSCULAR FUNCTION Muscle Alterations		Pressure Modulator Radiometer	W92 70272	High Performance Aircraft Flight Dynamics 505-43-13	& Controls W83-7007
199-20-41	W83-70418	147-12-08 Chemical Kinetics of the Upper Atmosphere	W83-70272	Advanced Fighter Aircraft (F-15)	******
Muscle Atrophy		147-21-03	W83-70278	533-02-21	W83-7010
199-20-42 MUSCULAR TONUS	W83-70419	Development of Resonant Ionization Laser S	pectroscopy for	Highly Maneuverable Aircraft Technology 533-03-11	W83-7011
Muscle Atrophy		Tropospheric NOx Measurements 176-40-03	W83-70352	Platform Systems Study	VV 03-7011
199-20-42	W83-70419	NOAA 6 SATELLITE	***************************************	506-64-19	W83-7023
MX MISSILE		Cloud Properties from Satellite Radiances		NUTRITION Bone Loss	
Thermo-Gasdynamic Test Complex 506-51-41	W83-70126	672-20-09 NOAA 7 SATELLITE	W83-70492	199-20-31	W83-7041
		Verification and Analysis of Satellite Derived	Products	Food Requirements Production and Proces	ssing for CELS
RI .		146-71-00	W83-70257	199-60-42	W83-7044
N		NOISE MEASUREMENT Rotorcraft Vibration and Noise		Waste Management for CELSS 199-60-52	W83-7044
NATIONAL AIRSPACE UTILIZATION SYST	EM	532-06-13	W83-70098		
Advanced Transport Operating Systems		NOISE PREDICTION		0	
534-04-13	W83-70118	Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-70009	0	
NATURAL GAS EXPLORATION Oil and Gas Test Case Study		Aeroacoustics Research	***************************************	OCCULTATION	
677-41-16	W83-70532	505-31-33	W83-70010	Advanced Mission Study - Solar X-Ray Pinh	ole Satellite an
NATURAL LANGUAGE (COMPUTERS)	45 .46 .	Rotorcraft Vibration and Noise 532-06-13	W83-70098	Long Focal Length Coronagraph	14/02 7020
Advanced Concepts for Knowledge-Base 506-54-61	W83-70160	NOISE PREDICTION (AIRCRAFT)	***************************************	188-78-38 OCEAN COLOR SCANNER	W83-7039
NATURAL SATELLITES	1100 70100	RSRA Flight Research/Rotors		Ocean Advanced Studies	
Dynamics of Planetary Atmospheres		532-03-11	W83-70095	161-10-00	W83-7033
154-20-80 Planetary Infrared Imaging	W83-70310	Rotorcraft Systems Integration 532-06-11	W83-70096	OCEAN CURRENTS Research Mission Study - TOPEX	
196-41-77	W83-70403	NOISE PROPAGATION		161-10-01	W83-7033
Solar System Environments	14/00 70407	Aeroacoustics Research 505-31-33	W83-70010	Physical Oceanography	14/02 7022
199-50-42 NAVIER-STOKES EQUATION	W83-70437	NOISE REDUCTION	W63-70010	161-20-00 Altimeter Time-Dependent Current Studies	W83-7033
Computational and Analytical Fluid Dynam	nics	Fluid Mechanics of Turbomachinery/Lewis		161-20-07	W83-7033
505-31-03	W83-70003	505-31-32	W83-70009	Gulf of Mexico Circulation Studies	
NEBULAE Ground-Based Observations UV and (Ontical Astronomy	Aeroacoustics Research 505-31-33	W83-70010	161-20-10 OCEAN DATA ACQUISITIONS SYSTEMS	W83-7033
188-41-21	W83-70377	Community Response to Noise		Lidar and Acoustics Applications to Oc	ean Productivit
UV and Optical Astronomy		505-35-13	W83-70037	161-30-05	W83-7034
188-41-51	W83-70380	Rotorcraft Aeromechanics and Configurations 505-42-11	W83-70064	OCEAN DYNAMICS Physical Oceanography	
NEODYMIUM LASERS Meteorological Lidar Development		Rotorcraft Vibration and Noise		161-20-00	W83-7033
146-74-01	W83-70263	532-06-13	W83-70098	Ocean Optics	
NEPHANALYSIS VEGA Balloon Nephelometer Design		NOISE TOLERANCE Community Response to Noise		161-30-00	W83-7033
157-04-80	W83-70327	505-35-13	W83-70037	Oceanic Research Support Activities 161-50-00	W83-7034
NEPHELOMETERS		NONDESTRUCTIVE TESTS		Climate Research Program Support	
VEGA Balloon Nephelometer Design 157-04-80	W83-70327	Life Prediction for Structural Materials 505-33-23	W83-70022	672-50-06 OCEAN SURFACE	W83-7049
NEPTUNE (PLANET)	W03-70327	Non-Destructive Evaluation and Tribology	***************************************	Research Mission Study - TOPEX	
Planetary Infrared Imaging		506-53-12	W83-70128	161-10-01	W83-7033
196-41-77	W83-70403	Payloads Definition Methods 506-53-56	W83-70145	Advanced Earth Orbiter Radio Meti Development	nc Technolog
NETWORK ANALYSIS		NONFLAMMABLE MATERIALS	***************************************	161-10-03	W83-7033
Future Data Systems Concepts 506-58-11	W83-70195	Fire Resistant Composites		Polar Oceanography	
Network Monitor and Control Technology		505-33-31 Aircraft Fire Safety Materials Testing	W83-70023	161-40-00	W83-7034
310-30-69	W83-70569	505-45-17	W83-70090	Coupled Active-Passive Sea Ice Analysis 161-40-02	W83-7034
NETWORK CONTROL		NONLINEAR EQUATIONS		OCEAN TEMPERATURE	
Communications Laboratory for Transport and Satellite Network Evaluation	ider Development	Dynamics of Planetary Atmospheres 154-20-80	W83-70309	Numerical Analysis of Remote Sensing Data	a W83-7025
650-60-23	W83-70477	NONLINEAR SYSTEMS	Was-70309	146-66-01 Lidar and Acoustics Applications to Oc	
Network Monitor and Control Technology		Computational and Analytical Fluid Dynamics		161-30-05	W83-7034
310-30-69	W83-70569	505-31-03 Analysis and Design	W83-70003	Climate Observations	
NEUROPHYSIOLOGY Space Motion Sickness		506-53-53	W83-70143	672-40-00 OCEANOGRAPHIC PARAMETERS	W83-7049
199-20-21	W83-70414	NORTH AMERICA		High Resolution Laser Research	
NEUROTRANSMITTERS		ER SEASAT Digital SAR Processing	14/00 70515	506-54-23	W83-7015
Basic Mechanisms Underlying Space Moti		677-48-01 NOVAE	W83-70545	OCEANOGRAPHY Ocean Advanced Studies	
199-20-22 General biomedical Research	W83-70415	UV and Optical Astronomy		161-10-00	W83-7033
199-20-92	W83-70428	188-41-51	W83-70380	Polar Oceanography	
NEUTRON ACTIVATION ANALYSIS		NOZZLE DESIGN Inlets and Nozzles		161-40-00	W83-7034
Planetary Materials Laboratory and Analy		505-40-02	W83-70055	Ocean Processes Branch Scientific Program 161-50-02	Support W83-7034
152-02-40	W83-70294	Non-Axisymmetric Nozzle Research		Oceanic Pilot System	VV03-7034
NEUTRON FLUX DENSITY Cross Section Determination Cosmic	: Ray Induced	505-43-22 High-Speed Aerodynamics and Propulsion In	W83-70072	656-13-40	W83-7047
Background Determination Neutron Transpo		505-43-23	W83-70073	OCEANS	
Planetary Evaluation and Dynamic Studies	W62 70201	Interagency and Industrial Assistance and Te	sting	Ocean Optics	14/02 7000
153-03-50 NICKEL ALLOYS	W83-70301	505-43-33 NOZZLE FLOW	W83-70076	161-30-00 OIL EXPLORATION	W83-7033
Experimental Magnetism		Computational Fluid Dynamics for Turbomaci	hinery	Oil and Gas Test Case Study	
153-08-50	W83-70305	505-31-02	W83-70002	677-41-16	* "W83-7053

ON-LINE SYSTEMS Archival Mass Memory	
506-58-10	W83-70194
Oceanic Pilot System 656-13-40	W83-70479
Transportable Applications Executive (TAE) 656-44-10	W83-70486
Improved On-Line Availability of Data 656-50-01	W83-70487
Mission Operations Technology	
310-40-45 ONBOARD DATA PROCESSING	W83-70573
Data Systems Research and Technology 506-58-13	W83-70196
Advanced Technological Development General	I Signal and
Data Processing Electronics Solid State Detecto 188-78-51	w83-70393
OPERATIONAL PROBLEMS Space Human Factors	
506-57-21 OPERATIONS	W83-70189
Human-to-Machine Interface Technology 310-40-37	W83-70572
Mission Operations Technology 310-40-45	W83-70573
OPERATIONS RESEARCH Space Operations Study Follow on	
906-64-20 OPTICAL COMMUNICATION	W83-70584
Communications Systems Technology Develop	ment W83-70567
310-20-67 OPTICAL DATA PROCESSING	
Photophysics and Optical Information Processi 506-54-11	W83-70147
Submillimeter & Optical Processing Device Re 506-54-12	search W83-70148
Solid State & Optical Device Research 506-54-13	W83-70149
Electronics Research and Technology 506-54-15	W83-70150
Programmable Mask Technology 506-54-17	W83-70152
Data Systems Research and Technology	
506-58-15 Data Systems Research and Technology	W83-70197
506-58-16 On-line Data Ingest/Staging System	W83-70198
506-58-19 OPTICAL DATA STORAGE MATERIALS	W83-70199
Image Processing Technology 310-40-46	W83-70574
OPTICAL MEASUREMENT Viscous Flows	
505-31-11 Photophysics and Optical Information Processi	W83-70004
506-54-11	W83-70147
OPTICAL MEMORY (DATA STORAGE) Image Processing Technology	
310-40-46 OPTICAL RADAR	W83-70574
Safety - Atmospheric Processes 505-45-09	W83-70087
High Resolution Laser Research 506-54-23	W83-70154
Meteorological Observing System Developmen 146-70-00	t W83-70256
Tropospheric Wind Measurement Assessment 146-72-04	W83-70260
Meteorological Lidar Development 146-74-01	
140-74-01	W/93 70262
Upper Atmosphere Research - Field Measurem	
147-11-00 Lidar and Acoustics Applications to Ocean	nents W83-70266 Productivity
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure	nents W83-70266 Productivity W83-70341 ments
147-11-00 Lidar and Acoustics Applications to Ocean 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL	ments W83-70266 Productivity W83-70341 ments W83-70500
147-11-00 Lidar and Acoustics Applications to Oceal 161-30-05 Aircraft Borne LIDAR for 03 and 0H Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01	ments W83-70266 Productivity W83-70341 ments W83-70500
147-11-00 Lidar and Acoustics Applications to Ocean 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION	ments W83-70266 Productivity W83-70341 ments W83-70500
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53	ments W83-70266 Productivity W83-70341 ments W83-70500
147-11-00 Lidar and Acoustics Applications to Oceal 161-30-05 Aircraft Borne LIDAR for 03 and 0H Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhance 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55	ments W83-70266 Productivity W83-70341 ments W83-70500 ment W83-70030 W83-70143
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 508-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations	nents W83-70266 Productivity W83-70341 ments W83-70500 ement W83-70030 W83-70143 W83-70144 sciplines for
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION	ments W83-70266 Productivity W83-70341 ments W83-70500 ment W83-70030 W83-70143
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00	nents W83-70266 Productivity W83-70341 ments W83-70500 ement W83-70030 W83-70143 W83-70144 sciplines for
147-11-00 Lidar and Acoustics Applications to Oceal 161-30-05 Aircraft Borne LIDAR for 03 and 0H Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhance 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01	nents W83-70266 of Productivity W83-70341 ments W83-70500 erment W83-70030 w83-70144 sciplines for W83-70230 w83-70230 w83-70333
147-11-00 Lidar and Acoustics Applications to Oceal 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhance 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Differenamently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development	w83-7030 w83-70341 ments w83-70500 ement w83-70030 w83-70144 sciplines for w83-70332 w83-70332 w83-70333 Technology
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/Orbit Technology	ments W83-70266 on Productivity W83-70341 ments W83-70500 ment W83-70143 W83-70144 sciplines for W83-70332 W83-70333 Technology W83-70334
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03	w83-7030 w83-70341 ments w83-70500 ement w83-70030 w83-70144 sciplines for w83-70332 w83-70332 w83-70333 Technology
147-11-00 Lidar and Acoustics Applications to Oceal 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhance 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Differenamently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/Orbit Technology 310-10-26 Space Systems and Navigation Technology 310-10-63	ments W83-70266 on Productivity W83-70341 ments W83-70500 ment W83-70143 W83-70144 sciplines for W83-70332 W83-70333 Technology W83-70334
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/ Orbit Technology 310-10-26 Space Systems and Navigation Technology 310-10-63 Operations Support Computing Technology 310-10-63	ments W83-70266 on Productivity W83-70341 ments W83-70500 ment W83-70143 W83-70144 sciplines for W83-70230 W83-70332 W83-70334 W83-70334 W83-70555
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhance 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Dirermanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/Orbit Technology 310-10-26 Space Systems and Navigation Technology 310-10-63 Operations Support Computing Technology 310-40-26 ORBIT SPECTRUM UTILIZATION Technical Consultation Services	ments W83-70266 on Productivity W83-70341 ments W83-70030 w83-70143 w83-70144 sciplines for W83-70230 w83-70230 w83-70333 Technology w83-70555 w83-70559 w83-70571
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/ Orbit Technology 310-10-26 Space Systems and Navigation Technology 310-10-63 Operations Support Computing Technology 310-40-26 ORBIT SPECTRUM UTILIZATION Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies	ments W83-70266 of Productivity W83-70341 ments W83-70500 ment W83-70143 w83-70144 sciplines for W83-70230 w83-70230 w83-70333 Technology w83-70556 w83-70559 w83-70571 w83-70466
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Cocan Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/Orbit Technology 310-10-63 Operations Support Computing Technology 310-10-63 Operations Support Computing Technology 310-40-26 ORBIT SPECTRUM UTILIZATION Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01 Propagation Studies and Measurements	w83-70266 h Productivity w83-70341 ments w83-70500 ement w83-70143 w83-70144 sciplines for w83-70230 w83-70332 w83-70333 Technology w83-70555 w83-70559 w83-70569 w83-70466 w83-70466
147-11-00 Lidar and Acoustics Applications to Oceai 161-30-05 Aircraft Borne LIDAR for O3 and OH Measure 673-14-00 OPTIMAL CONTROL Flight Control Concepts and Reliability Enhanc 505-34-01 OPTIMIZATION Analysis and Design 506-53-53 Space Vehicle Dynamics Methodology 506-53-55 Technology Systems Analysis Across Di Permanently Orbiting Space Stations 506-64-13 ORBIT CALCULATION Ocean Advanced Studies 161-10-00 Research Mission Study - TOPEX 161-10-01 Advanced Earth Orbiter Radio Metric Development 161-10-03 Attitude/ Orbit Technology 310-10-26 Space Systems and Navigation Technology 310-10-63 Operations Support Computing Technology 310-40-26 ORBIT SPECTRUM UTILIZATION Technical Consultation Services 643-10-01 Spectrum and Orbit Utilization Studies 643-10-01	w83-70266 h Productivity w83-70341 ments w83-70500 ement w83-70030 w83-70144 sciplines for w83-70230 w83-70230 w83-70333 Technology w83-70555 w83-70555 w83-70571 w83-70466 w83-70467 w83-70470

Entry Vehicle Aerothermodynamics 506-51-13	W83-70124
Advanced Carbon-Carbon Panels	W83-70138
506-53-37 Electric Propulsion Technology	
506-55-22 Variable Thrust OTV Propulsion Technology	W83-70168
506-60-42 OTV Propulsion Performance and Plume Cl	W83-70210
506-60-49	W83-70211
Technology Requirements for Advanced Space Systems	
506-63-23 Conceptual Characterization and Technolog	W83-70216 v Assessment
506-63-29	W83-70218
High Energy Upper Stage 906-63-00	W83-70582
Advanced Transportation 906-63-00	W83-70583
Orbital Transfer Vehicle Ground Operations St 906-64-24	udy W83-70588
ORBITAL ASSEMBLY	iment (SADE)
906-55-00	W83-70580
Demonstrations	pecial Flight
906-64-23 ORBITAL POSITION ESTIMATION	W83-70587
Attitude/Orbit Technology 310-10-26	W83-70555
Very Long Baseline Interferometry (VLBI) Tr	
Tracking and Data Relay Satellite (TDRS) 310-20-39	W83-70562
ORBITAL SERVICING Automation Systems Research	
506-54-63	W83-70161
Automation Technology for Planning Teleo Robotics	
506-54-65 Automation Research and Technology for Near-	W83-70162 Earth Mission
Operations 506-54-66	W83-70163
STS Control and Guidance Technology Develor 506-57-17	
Teleoperator and Robotics System Analysis	
506-64-23 Space Station Operations	W83-70234
506-64-27 Advanced Extravehicular Systems (Space Suit	W83-70237
199-60-21	W83-70442 pecial Flight
Demonstrations	-
906-64-23 Teleoperator Maneuvering System	W83-70587
906-75-00 Orbital Services	W83-70591
906-75-00	W83-70592
	1103 70332
ORBITAL SPACE STATIONS Multi-KW Solar Arrays	
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T	W83-70173
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49	
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-56-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13	W83-70173
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-56-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15	W83-70173 W83-70180
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16	W83-70173 W83-70180 W83-70196
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-15 Space Station Propulsion Requirements 506-64-12	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-56-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906 54-00 System Analysis and Evaluation of Permani	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 *** W83-70240 W83-70578
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-56-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 508-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permanic Orbiting Space Facilities	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 *** W83-70240 W83-70578
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permanic	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 It W83-70240 W83-70578 ently Manned
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-56-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-00 Manned Facilities (Space Station) 906-58-00 Manned Facilities (Space Station) 906-58-00 Advanced Transportation	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 tt W83-70240 W83-70578 ently Manned W83-70579 W83-70581
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 tt W83-70578 ently Manned W83-70579 W83-70581 W83-70583 low on Study
ORBITAL SPACE STATIONS Multr-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-00 Advanced Transportation 906-68-00 Advanced Transportation 906-68-00 Space Station Ground Operations Study Fol 906-64-20 SPAEL WORKERS	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 ** W83-70578 ently Manned W83-70579 W83-70581 W83-70583 low on Study W83-70586
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Sutt) 199-60-2	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 ** W83-70578 ently Manned W83-70579 W83-70581 W83-70583 low on Study W83-70586
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-00 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravelicular Systems (Space Suit)	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 It W83-70578 ently Manned W83-70581 W83-70583 low on Study W83-70586
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-68-00 Advanced Transportation 906-68-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-21 ORBITAL Giotto Ephemeris Support 155-03-02	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 It W83-70578 ently Manned W83-70581 W83-70583 low on Study W83-70586
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-58-16 Life Support Systems Technology Developmer 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-20 ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 196-41-76	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 tt W83-70578 ently Manned W83-70579 W83-70581 W83-70583 low on Study W83-70586
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permanic Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-300 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-20 Station Ground Systems Station Space Suit) 199-60-22 Asteroids 196-41-76 ORGANIC CHEMISTRY Chemical Evolution	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 tt W83-70578 ently Manned W83-70579 W83-70581 W83-70583 low on Study W83-70586 W83-70442 W83-70320 W83-70402
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-68-12 Life Support Systems Technology Developmer 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-22 RAYANCE STATION OPERATION ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 193-64-176 ORGANIC CHEMISTRY	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 M83-70240 W83-70578 Bently Manned W83-70581 W83-70583 Jow on Study W83-70586 W83-70442 W83-70320
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-68-12 Life Support Systems Technology Developmer 508-64-17 Manned Facilities 906-54-20 Manned Facilities (Space Station) 906-58-20 Advanced Transportation 906-63-20 Advanced Transportation 906-63-20 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Sut) 199-60-21 ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 196-41-76 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Organic Geochemistry 199-50-12	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 St W83-70578 ently Manned W83-70579 W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70442 W83-70442 W83-70442
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Sut) 199-60-21 ORBITS Giotto Ephemeris Support 156-03-02 Asteriods 196-41-76 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Organic Geochemistry 199-50-22 Food Requirements Production and Processin	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 St W83-70578 ently Manned W83-70579 W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70442 W83-70442 W83-70442
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-00 Advanced Transportation 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-68-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-17 Chemical Evolution 199-50-12 Organic Geochemistry 199-50-12 Coganic Geochemistry 199-50-12 Vaste Management for CELSS	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 II W83-70578 Ently Manned W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70402 W83-70402 W83-704044 W83-704044
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permanic Orbiting Space Facilities 906-54-00 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-12 Asteroids 199-61-176 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Crganic Geochemistry 199-50-22 Food Requirements Production and Processin 199-60-42 Waste Management for CELSS 199-60-52 ORGANIZATIONS	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 th W83-70578 ently Manned W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70442 W83-70442 W83-70444 W83-70444 W83-70445
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 506-55-49 Spacecraft Power Systems R & T 506-56-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-64-20 ORBITAL WORKERS Advanced Extravehicular Systems (Space Sut) 199-60-21 ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 199-61-76 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Organic Geochemistry 199-50-22 Food Requirements Production and Processir 199-60-42 Waste Management for CELSS	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 th W83-70578 ently Manned W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70442 W83-70442 W83-70444 W83-70444 W83-70445
ORBITAL SPACE STATIONS Multr-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permani Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-00 Space Station Ground Operations Study Fol 906-84-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-12 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Urganic Geochemistry 199-50-22 Food Requirements Production and Processin 199-60-52 ORGANIZATIONS Radio Technical Commission for Aeronautics (1) 534-04-10 ORGANS	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 W83-70240 W83-70578 ently Manned W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70402 W83-70402 W83-704044 W83-704045 RTCA)
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-37 Manned Facilities 906-54-00 System Analysis and Evaluation of Permand Orbiting Space Facilities 906-54-00 Manned Facilities (Space Station) 906-58-00 Manned Facilities (Space Station) 906-58-00 Space Station Ground Operations Study Fol 906-64-22 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-21 ORBITS Giotto Ephemeris Support 156-03-02 Asteriods 196-41-76 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Viganic Geochemistry 199-50-22 Food Requirements Production and Processin 199-60-52 ORGANIZATIONS Radio Technical Commission for Aeronautics (193-00-72) ORGANS Biological Effects of Particle Radiation 199-20-72	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 W83-70240 W83-70578 ently Manned W83-70581 W83-70581 W83-70586 W83-70586 W83-70442 W83-70402 W83-70402 W83-704044 W83-704045 RTCA)
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-20 System Analysis and Evaluation of Permanic Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-30 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-64-20 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-21 ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 196-41-76 ORCANIC CHEMISTRY Chemical Evolution 199-50-12 Food Requirements Production and Processin 199-60-42 Waste Management for CELSS 199-60-52 ORGANIZATIONS Radio Technical Commission for Aeronautics (1534-04-10 ORGANS Biological Effects of Particle Radiation 199-20-72 ORTHOSTATIC TOLERANCE Cardiovascular Deconditioning (USC)	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 It W83-70240 W83-70578 ently Manned W83-70581 W83-70581 W83-70583 low on Study W83-70586 W83-70442 W83-70442 W83-70444 W83-70444 W83-70445 eng for CELSS W83-70444 W83-70445 RTCA) W83-70117 W83-70425
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-00 System Analysis and Evaluation of Permanic Orbiting Space Facilities 906-54-00 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-20 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-12 ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 196-41-76 ORGANIC CHEMISTRY Chemical Evolution 199-50-12 Vaste Management for CELSS 199-60-52 ORGANIZATIONS Radio Technical Commission for Aeronautics (193-00-72 ORGANS Biological Effects of Particle Radiation 199-20-72 ORTHOSTATIC TOLERANCE Cardiovascular Deconditioning (JSC) 199-20-11	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 *** W83-70240 W83-70578 ently Manned W83-70579 W83-70581 W83-70586 ** W83-70442 W83-70402 W83-70402 W83-70404 W83-70404 W83-70405
ORBITAL SPACE STATIONS Multi-KW Solar Arrays 508-55-49 Spacecraft Power Systems R & T 508-55-75 Data Systems Research and Technology 506-58-13 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-15 Data Systems Research and Technology 506-58-16 Space Station Propulsion Requirements 506-64-12 Life Support Systems Technology Developmer 506-64-17 Manned Facilities 906-54-20 System Analysis and Evaluation of Permanic Orbiting Space Facilities 906-54-20 Manned Facilities (Space Station) 906-58-00 Advanced Transportation 906-63-30 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-63-00 Space Station Ground Operations Study Fol 906-64-20 ORBITAL WORKERS Advanced Extravehicular Systems (Space Suit) 199-60-21 ORBITS Giotto Ephemeris Support 156-03-02 Asteroids 196-41-76 ORCANIC CHEMISTRY Chemical Evolution 199-50-12 Food Requirements Production and Processin 199-60-42 Waste Management for CELSS 199-60-52 ORGANIZATIONS Radio Technical Commission for Aeronautics (1534-04-10 ORGANS Biological Effects of Particle Radiation 199-20-72 ORTHOSTATIC TOLERANCE Cardiovascular Deconditioning (USC)	W83-70173 W83-70180 W83-70196 W83-70197 W83-70198 W83-70229 It W83-70240 W83-70578 ently Manned W83-70581 W83-70581 W83-70583 low on Study W83-70586 W83-70442 W83-70442 W83-70444 W83-70444 W83-70445 eng for CELSS W83-70444 W83-70445 RTCA) W83-70117 W83-70425

OSCILLATIONS Investigation of Upper Atmosphere Dynamics w	rith Nimbus-7
Satellite Data 673-31-00	W83 70503
OSCILLATORS	Wa3 70503
Frequency and Timing Research 310-10-62	W83 70558
OUTGASSING	
Extended Atmospheres 154-80-80	W83 70317
OXIDATION Waste Management for CELSS	
199-60-52	W83 70445
OXIDATION RESISTANCE Thermal Protection Systems for Earth-To-Orbit	STS
506-53-33 OXYGEN	W83 70137
Solar Flux in Upper Atmosphere 147-15-00	W83-70273
OXYGEN SUPPLY EQUIPMENT	W03-70273
Space Station Life Support Technology 506-64-31	W83-70239
OZONE Upper Atmosphere Research - Field Measuren	nants
147-11-00	W83-70266
In-Situ Measurements of Stratospheric Ozone 147-11-05	W83-70268
Stratospheric Fourier Spectroscopy at Near Wavelengths	and Mid IR
147-12-05	W83-70270
Stratospheric Research Field Measureme Millimeter and Submillimeter Radiometry	
147-12-06 Stratospheric Research	W83-70271
147-30-02 Upper Atmosphere Research - Satellite Data A	W83-70284
147-41-00	W83-70287
Critical Examination of Upper Stratospheric N 147-43-00	Aeasurements W83-70288
Spectroscopic Properties of the Stratosphere 147-44-00	W83-70289
Assessment of Ozone Perturbations	
147-51-00 Development of Resonant Ionization Laser Spe	W83-70290 ectroscopy for
Tropospheric NOx Measurements 176-40-03	W83-70352
DASIBI Measurement of Ozone if	Profile and
Column-Content 673-11-00	W83 70498
Intercomparison of Dobson and II Spectrometer	nterferometric
673-13-00 Aircraft Borne LIDAR for O3 and OH Measure	W83-70499
673-14-00	W83-70500
673-14-00 Correlative Measurement Improvements 673-18-00	W83-70500 W83-70502
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data	W83-70500 W83-70502 vith Nimbus-7
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w	W83-70500 W83-70502 vith Nimbus-7 W83 70503
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00	W83-70500 W83-70502 vith Nimbus-7 W83 70503 the Middle
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY	W83-70500 W83-70502 vith Nimbus-7 W83-70503 the Middle W83-70504
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04	W83-70500 W83-70502 vith Nimbus-7 W83-70503 the Middle W83-70504
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ	W83-70500 W83-70502 vith Nimbus-7 W83-70503 the Middle W83-70504 Sensor
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05	W83-70500 W83-70502 vith Nimbus-7 W83 70503 the Middle W83-70504 Sensor W83-70267
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone	W83-70500 W83-70502 vith Nimbus-7 W83 70503 the Middle W83-70504 Sensor W83-70267
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P	W83-70500 W83-70502 vith Nimbus-7 W83 70503 the Middle W83-70504 Sensor W83-70267
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11	W83-70500 W83-70502 vith Nimbus-7 W83 70503 the Middle W83-70504 Sensor W83-70267
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 220NOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin	W83-70500 W83-70502 vith Nimbus-7 W83 70503 the Middle W83-70504 Sensor W83-70267 W83-70268
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS	W83-70500 W83-70502 vith Nimbus-7 W83-70503 the Middle W83-70504 Sensor W83-70268 W83-70268
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry	W83-70500 W83-70502 vith Nimbus-7 W83 70503 vith Middle W83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS)	W83-70500 W83-70502 vith Nimbus-7 W83 70503 ven Middle W83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea	W83-70500 W83-70502 vith Nimbus-7 W83 70503 ven Middle W83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70268 W83-70268 W83-70338 gs W83-70133 W83-70435
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 506-37-20 Programmable Mask Technology	W83-70500 W83-70502 wth Nimbus-7 W83 70503 wthe Middle W83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70435 uch W83-70051
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133 W83-70435 arch W83-70051 W83-70152
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-53-0-01 PARAMETER IDENTIFICATION	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133 W83-70435 w83-70152 w83-70152 w83-70159 w83-70159
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Vanability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133 W83-70133 W83-70159 w83-70159 w83-70481 s and Flying
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 556-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics Qualities 505-43-11 Spacecraft Controls and Guidance	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70338 gs W83-70133 W83-70133 W83-70159 ent W83-70481 s and Flying W83-7070
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics Qualities 505-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study	W83-70500 W83-70502 W83-70503 the Middle W83-70504 Sensor W83-70268 W83-70268 W83-70338 gs W83-70133 W83-70152 W83-70051 W83-70152 W83-70159 set W83-70159 set W83-70070 W83-70070 W83-70185
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics Qualities 505-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study 677-29-17 PARTICLE ACCELERATION	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70268 W83-70133 W83-70133 W83-70152 W83-70152 W83-70159 w83-70481
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Vanability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics 505-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study 677-29-17	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70268 W83-70133 W83-70133 W83-70152 W83-70152 W83-70159 w83-70481
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 556-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamic: Qualities 505-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study 677-29-17 PARTICLE ACCELERATION Particle Astrophysics and Experiment Defin	W83-70500 W83-70502 W83-70503 W83-70504 W83-70504 W83-70268 W83-70268 W83-70338 gs W83-70133 W83-70133 W83-70152 W83-70151 W83-70151 W83-70159 ent W83-70159 ent W83-70159 ent Sand Flying W83-70185 W83-70525 ention Studies W83-70383
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics 0ualities 505-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study 677-29-17 PARTICLE ACCELERATION Particle Astrophysics and Experiment Defin 188-46-56 PARTICLE SIZE DISTRIBUTION Giotto particulate Impact Analyzer (PIA) Co	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70268 W83-70338 gs W83-70133 W83-70152 W83-70152 w83-70159 w83-70481 s and Flying W83-70185 W83-70185 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Variability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 673-41-00 673-41-00 673-41-00 Fraction of Stratospheric Ozone 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamic: Qualities 505-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study 677-29-17 PARTICLE ACCELERATION Particle Astrophysics and Experiment Defin 188-46-56 PARTICLE SIZE DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) Giotto Dust Impact Detection System (DIDSY)	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70383 w83-70435 w83-70133 W83-70152 W83-70159 w83-70159 w83-70159 w83-70159 w83-70481 w83-70481 w83-70481 w83-70481 w83-70481 w83-70481 w83-70481 w83-70481 w83-70481
673-14-00 Correlative Measurement Improvements 673-18-00 Investigation of Upper Atmosphere Dynamics w Satellite Data 673-31-00 Vanability and Trends in Stratospheric Ozone Atmosphere and UV Solar Flux Variations 673-41-00 OZONOMETRY Stratospheric Research Balloon Laser In-Situ 147-11-04 In-Situ Measurements of Stratospheric Ozone 147-11-05 P PACIFIC OCEAN Time Dependent Fields 161-20-11 PAINTS Electrically Conductive Thermal Control Coatin 506-53-26 PALEONTOLOGY Organic Geochemistry 199-50-22 PARALLEL PROCESSING (COMPUTERS) Aerospace Computer Science University Resea 505-37-20 Programmable Mask Technology 506-54-17 MPP - Systems Software R & T 506-54-56 Information Sciences Research and Developme 656-30-01 PARAMETER IDENTIFICATION High Performance Aircraft Flight Dynamics 005-43-11 Spacecraft Controls and Guidance 506-57-13 Attitude Tracker Feasibility Study 677-29-17 PARTICLE ACCELERATION Giotto particulate Impact Analyzer (PIA) Co	W83-70500 W83-70502 w83-70503 w83-70504 Sensor W83-70267 W83-70268 W83-70268 W83-70338 gs W83-70133 W83-70152 W83-70152 w83-70159 w83-70481 s and Flying W83-70185 W83-70185 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052 w83-7052

PARTICLES		Upper Atmosphere Research - Theoretic		Fluid and Electrolyte Changes	14/02 70422
Planetary Instrument Definition 157-20-70	W83-70329	147-31-00 General Circulation Modeling of the Stra	W83-70285 tosphere	199-20-62 Radiation Effects and Protection	W83-70423
PATHOGENESIS General biomedical Research		147-32-00	W83-70286	199-20-71 General biomedical Research	W83-70424
199-20-92	W83-70428	Critical Examination of Upper Stratosph 147-43-00	W83-70288	199-20-92	W83-70428
PATTERN RECOGNITION	Evenet Sustains	Data Survey and Evaluation		Biological Adaptation 199-40-32	W83-70433
Advanced Concepts for Knowledge-Based 506-54-61	W83-70160	147-51-02 Cosmic Chemistry Aeronomy Comets 0	W83-70291 Grains	Cosmos Flight Experiments Project	VV03-70433
Studies of the Distribution of Elements and	Mineral Phases	154-75-80	W83-70315	199-70-12	W83-70448
Among Meteorites 152-03-60	W83-70295	Kinetic Studies Involving CH302 H02 Tropospheric Importance	and IO Radicals of	Sample Bank 199-70-32	W83-70449
Coupled Active-Passive Sea Ice Analysis	11/00 70040	176-30-01	W83-70351	Interdisciplinary Research	11/02 70456
161-40-02 Cloud Properties from Satellite Radiances	W83-70343	PHOTOGRAMMETRY Digital Topographic Mapp	ina Mission	199-90-71 Ames Research Center Initiatives	W83-70456
672-20-09	W83-70492	Requirements/Feasibility Study		199-90-72	W83-70457
Use of TM for the Detection of Mineralization Terrain Through Inference of Geobotanical Para		677-29-12 Digital Topographic Mapp	W83-70522 oing Mission	PILOT ERROR Flight Management Systems	
677-42-04	W83-70536	Requirements/Feasibility Study	-	505-35-21	W83-70038
PATTERN REGISTRATION Spatial Radar Image Registration		677-29-12 PHOTOGRAPHY	W83-70523	PILOT TRAINING Crew Cockpit Interface Technology	
677-48-03	W83-70546	Tribological Experiments in Zero Gravity		505-35-23	W83-70039
PAYLOAD CONTROL Payloads Definition Methods		542-03-27 PHOTOINTERPRETATION	W83-70245	Powered Lift Systems Technology - Harrie Program	er Flight Research
506-53-56	W83-70145	Development of New Remote Da	ata Interpretation	533-02-51	W83-70107
PAYLOAD DEPLOYMENT & RETRIEVAL SYST Orbital Services	rem	Techniques 175-20-00	W83-70347	PIONEER PROJECT Planetary Atmospheric Composition Structure Planetary Atmospheria Composition Structure Planetary Atmospheria Composition Structure Plane	rture and History
906-75-00	W83-70592	Ground-Based Observations of the Sun	W63-70347	154-10-80	W83-70308
PAYLOAD MASS RATIO Advanced Transportation Shuttle Derived	Vehicles (SDV)	188-38-52 PHOTOLYSIS	W83-70374	Planetary Data Network Project 656-80-01	W83-70489
906-65-00	W83-70589	Upper Atmosphere Research - Field Mea	surements	PIPELINING (COMPUTERS)	
PAYLOAD RETRIEVAL (STS)		147-11-00	W83-70266	Information Sciences Research and Develo 656-30-01	opment W83-70481
Teleoperator Maneuvering System 906-75-00	W83-70591	PHOTOMETRY Asteroids		PLANETARY ATMOSPHERES	W63-70467
PAYLOADS		196-41-76	W83-70402	Planetary Atmospheric Composition Strui	
Bioprocessing Studies 179-13-72	W83-70354	PHOTONS Ultraviolet Detector Development		154-10-80 Dynamics of Planetary Atmospheres	W83-70308
Life Sciences Payload Accommodations	W00 70450	188-41-24	W83-70379	154-20-80	W83-70310
199-80-48 Mammalian Development Facility	W83-70453	X-Ray Astronomy 188-46-59	W83-70388	Planetary Clouds Particulates and Ices 154-30-80	W83-70311
199-80-62	W83-70455	X-Ray Astronomy CCD Instrumentation I	Development	Remote Sensing of Atmospheric Structure	
Space Station Resource Observations Payloa 677-29-14	d Study W83-70524	188-46-59 PHOTOSYNTHESIS	W83-70389	154-40-80 Atomic and Molecular Properties of Plane	W83-70312
Sounding Rockets Experiments (Astronomy)		Food Requirements Production and Pro-		Constituents	
879-11-41 Space Platform Specification Development	W83-70552	199-60-42 PHOTOVOLTAIC CELLS	W83-70444	154-50-80 Planetary Aeronomy Theory and Analysis	W83-70313
906-50-00	W83-70577	Photovoltaic Research and Technology		154-60-80	W83-70314
PERFORMANCE PREDICTION Engine Systems Research		506-55-42	W83-70170	Cosmic Chemistry Aeronomy Comets Gr. 154-75-80	ains W83-70315
505-40-62	W83-70061	Solar Cell Research 506-55-43	W83-70171	Infrared Experiment Development	
Turbine Engine Hot Section Technology (HOS 533-04-12	ST) W83-70115	Solar Array Flight Experiment (SAFE) D	ynamics & Control	157-04-80 Improvements in Neutral and Ion Mass Sp	W83-70325
Advanced Space Structures Antenna		Augmentation (Flights 1 and 2) 506-62-49	W83-70215	157-04-80	W83-70326
Development	W83-70141	Space Calibration of Solar Cells		Planetary Instrument Development Pro	gram / Planetary
506-53-45 OTV Propulsion Performance and Plume C		542-03-20 PHOTOVOLTAIC CONVERSION	W83-70244	Astronomy 157-05-50	W83-70328
506-60-49	W83-70211	Photovoltaic Research and Technology		Advanced Infrared Astronomy and Labora	
PERFORMANCE TESTS Multifunction SAR Technology		506-55-42 Solar Cell Research	W83-70170	196-41-54 Planetary Astronomy and Supporting Lab	W83-70396 poratory Research
506-54-27	W83-70157	506-55-43	W83-70171	196-41-67	W83-70397
PERIHELIONS Comets		Multi-KW Solar Arrays 506-55-49	W83-70173	Optical Astronomy 196-41-71	W83-70399
196-41-75	W83-70401	Space Energy Conversion Support		Chemical Evolution	
PEROXIDES Kinetic Studies Involving CH3O2 HO2 and	IO Radicals of	506-55-70 PHYSICAL CHEMISTRY	W83-70178	199-50-12 Solar System Environments	W83-70434
Tropospheric Importance		Advanced Computational Concepts		199-50-42	W83-70437
176-30-01 PERSONNEL SELECTION	W83-70351	505-37-21 Planetary Petrology	W83-70052	PLANETARY COMPOSITION X-Ray Gamma-Ray and Neutron/Gamma-	Ray Methods for
Human Behavior and Performance		153-02-40	W83-70299	Planetary Exploration	•
199-20-82 PETROLOGY	W83-70427	PHYSICS AND CHEMISTRY EXPERIMENT Multidisciplinary Research	I IN SPACE	157-03-50 Planetary Instrument Definition	W83-70324
Planetary Petrology		506-56-20	W83-70184	157-20-70	W83-70329
153-02-40 JPL Petrology Support	W83-70299	Development of a Shuttle Flight Experime	ent Drop Dynamics	PLANETARY CRATERS Experimental Impact Cratering	
153-02-70	W83-70300	Module 542-03-01	W83-70241	153-08-40	W83-70304
Early Crustal Genesis 153-09-40	W83-70306	PHYSIOCHEMISTRY		PLANETARY EVOLUTION Formation Evolution and Stability of P	roto Stallar Dieke
PHARMACOLOGY	***************************************	Muscle Alterations 199-20-41	W83-70418	153-01-60	W83-70298
Bioseparation Processes 179-80-40	W83-70365	Muscle Atrophy	14/00 70440	JPL Petrology Support 153-02-70	W83-70300
Crew Health Maintenance	W03-70303	199-20-42 Fluid and Electrolyte Change	W83-70419	Early Crustal Genesis	***************************************
199-10-32 Cardiovascular Deconditioning	W83-70410	199-20-61	W83-70422	153-09-40 Planetary Atmospheric Composition Struc	W83-70306
199-20-12	W83-70413	Fluid and Electrolyte Changes 199-20-62	W83-70423	154-10-80	W83-70308
Space Motion Sickness	14100 70444	PHYSIOLOGICAL EFFECTS		Chemical Evolution	14/00 70404
199-20-21 PHASE CONTROL	W83-70414	Operational Laboratory Support 199-10-11	W83-70405	199-50-12 Solar System Environments	W83-70434
X-Band Uplink Development		Medical Operations Longitudinal Studies		199-50-42	W83-70437
310-20-64 PHASE TRANSFORMATIONS	W83-70564	199-10-21 Crew Health Maintenance	W83-70407	PLANETARY GEOLOGY Planetary Geology	
Cloud Physics		199-10-32	W83-70410	151-01-70	W83-70292
179-75-10 PHOSPHORS	W83-70363	Cardiovascular Deconditioning (JSC) 199-20-11	W83-70412	Planetary Materials Laboratory and Analyt 152-02-40	W83-70294
Luminescence Detector from Space		Cardiovascular Deconditioning		JSC General Operations Support - Planetar	y Materials
677-29-22	W83-70527	199-20-12	W83-70413	152-05-40	W83-70297
PHOTOCHEMICAL OXIDANTS Stratospheric Research Field Measuremen	nts Program	Basic Mechanisms Underlying Space Mot 199-20-22	W83-70415	Planetary Petrology 153-02-40	W83-70299
Millimeter and Submillimeter Radiometry	-	Bone Loss		JPL Petrology Support	
147-12-06	W83-70271	199-20-31 Bone Alterations	W83-70416	153-02-70	W83-70300
PHOTOCHEMICAL REACTIONS Stratospheric Fourier Spectroscopy at Nea	r and Mid IR	199-20-32	W83-70417	Early Crustal Genesis 153-09-40	W83-70306
Wavelengths	W83-70270	Muscle Alterations 199-20-41	W83-70418	JSC General Operations - Geophysics & Ge	eochemistry
147-12-05 Chemical Kinetics of the Upper Atmosphere	1103-102/0	Muscle Atrophy		153-10-40	W83-70307
147-21-03	W83-70278	199-20-42 Blood Alterations (Influence of Space fli	W83-70419	X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration	nay Methods for
Photochemistry of the Upper Atmosphere 147-22-01	W83-70279	and Blood-Forming Tissues)	-	157-03-50	W83-70324
Upper Atmosphere Research - Laboratory (199-20-51 Blood Alterations	W83-70420	PLANETARY RADIATION Cross Section Determination Cosmic	Ray Induced
147-23-00	W83-70280	199-20-52	W83-70421	Background Determination Neutron Transpor	
Stratospheric Research 147-30-02	W83-70284	Fluid and Electrolyte Change 199-20-61	W83-70422	Planetary Evaluation and Dynamic Studies 153-03-50	W83-70301

PLANETARY ROTATION	Composites for Advanced Space Systems 506-53-23 W:	83-70131	Space Vehicle Structural Dynamic Analysis and	Synthesis
Dynamics of Planetary Atmospheres 154-20-80 W83-7030	POLYMER CHEMISTRY	83-70131	Methods 506-53-59 W	/83-70146
Dynamics of Planetary Atmospheres 154-20-80 W83-7031	Fire Resistant Composites 505-33-31 Wi	83-70023	Meteorological Satellite Data Research 146-60-00 W	V83-70251
154-20-80 W83-7031 PLANETARY STRUCTURE	Composites for Airframe Structures		Propagation Studies and Measurements	
JPL Petrology Support	DOLVERD MATRIX COLOROSTES	83-70025	643-10-03 W REPROCESSING	/83-70470
153-02-70 W83-7030 PLANETARY SURFACES	Life Prediction for Structural Materials		Spatial Radar Image Registration	
Planetary Petrology	Euro Posistant Compositos	83-70022 P	677-48-03 W Reserving	V83-70546
153-02-40 W83-7029 Remote Sensing	505-33-31 W	83-70023	Curation of Extraterrestrial Samples	
153-07-40 W83-7030		83-70024 p	152-04-40 WRESSURE EFFECTS	V83-70296
Planetary Astronomy and Supporting Laboratory Researce 196-41-67 W83-7039	Composites for Airframe Structures	-	Quantitative Infrared Spectroscopy of Minor Con-	stituents of
PLANETOLOGY	7 505-33-33 W Fundamentals of Mechanical Behavior of the second secon	83-70025 Composite	the Earth's Stratosphere 147-20-03 W	v83-70276
Extended Atmospheres 154-80-80 W83-7031	Matrices 5 506-53-15 W.	83-70129 P	RESSURE GRADIENTS	
PLANETS W63-7031	Composites for Advanced Space Systems	63-70125	B-57B Flight Investigation of Environmental Haza 505-45-01 W	ards V83-70083
X-Ray Gamma-Ray and Neutron/Gamma-Ray Methods for	r 506-53-23 Wi Effects of Space Environment on Composites	83-70131 p	RESSURE MEASUREMENT	
Planetary Exploration 157-03-50 W83-7032	4 506-53-25 W	83-70132		v83-70004
Detection of Other Planetary Systems 196-41-68 W83-7039	Space Durable Composites and Thermal Control 8 506-53-29 W	ol Surfaces p 83-70135	RESSURE MODULATOR RADIOMETERS Pressure Modulator Radiometer	
Radio Astronomy	POLYMER PHYSICS		147-12-08 V	v83-70272
196-41-73 W83-7040 Digital Image Recovery and Data Management	p Fire Resistant Composites 505-33-31 W	83-70023	RESSURE RECOVERY Fan and Compressor Research	
656-31-02 W83-7048	2 Fundamentals of Mechanical Behavior of	Composite	505-40-12 V	v83-70056
PLANKTON Lidar and Acoustics Applications to Ocean Productivi	Matrices v 506-53-15 W	83-70129 P	RESSURE SENSORS Test Methods and Instrumentation	
161-30-05 W83-7034	PORTABLE LIFE SUPPORT SYSTEMS		505-31-51 V	V83-70013
PLANT STRESS Use of TM for the Detection of Mineralization in Vegetate	Advanced Extravehicular Systems (Space Suit) d 199-60-21 W	83-70442	Global Weather Research - Microwave Pressu 146-72-01 W	ire Sounder V83-70258
Terrain Through Inference of Geobotanical Parameters	POSITIONING	Р	REVENTION	
677-42-04 W83-7053 PLANTS (BOTANY)	 Development of a Shuttle Flight Experiment Drop Module 	Dynamics	Bone Alterations 199-20-32 W	V83-70417
Developmental Biology		83-70241	Muscle Alterations	
199-40-22 W83-7043 Biological Adaptation		83-70357	199-20-41 V Muscle Atrophy	V83-70418
199-40-32 W83-7043		83-70364	199-20-42 V	V83-70419
Food Requirements Production and Processing for CELS 199-60-42 W83-7044		63-70304	Human Behavior and Performance 199 20-82 V	V83-70427
PLÄSMA CHEMISTRY	Particle Astrophysics and Experiment Definition	on Studies 83-70383	Cosmos Flight Experiments Project	
Improvements in Neutral and Ion Mass Spectrometry 157-04-80 W83-7032			199 70-12 V RIMATES	V83-70448
PLASMA DIAGNOSTICS	Advanced Life Support Systems 199-60-11 W	83-70440	Large Primate Facility	UDO 70454
Development of Experiment and Hardware 188-38-51 W83-7037	1 POWDER METALLURGY		199-80-52 V ROBLEM SOLVING	V83-70454
PLASMA INTERACTIONS	High Temperature Materials 505-33-12 W	83-70018	Mathematics for Engineering and Science 505-31-83 W	V83-70016
Spacecraft Power Systems R & T 506-55-75 W83-7018	O Advanced Structural Alloys	Р	ROCEDURES	V03-70010
PLASMA PHYSICS	505-33-13 W POWER AMPLIFIERS	83-70019	Refining of Nonterrestrial Materials	V83-70130
Space Plasma Data Analysis 385-36-01 W83-7045	8 RF Components for Satellite Communications System		506-53-17 V ROCUREMENT	V63-70130
PLASMA PROPULSION	650-60-22 W POWER CONDITIONING	83-70476	Class VI Computational Capability Support	v83-70053
Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-7016	g Space Energy Conversion Support	Р	505-37-31 V RODUCTIVITY	V83-70053
PLASMA SHEATHS	506-55-70 W Power Systems Management and Distribution	83-70178	Advanced Space Structural Concepts 506-53-40 V	V83-70139
Space Plasma Data Analysis 385-36-01 W83-7045	g 506-55-72 W	83-70179	Lidar and Acoustics Applications to Ocean F	Productivity
PLASMASPHERE Improvements in Neutral and Ion Mass Spectrometry	Multi-100 kW Low Cost Earth Orbital Systems 506-55-79 W	83-70183	161 30-05 V Station Monitor and Control Technology	V83-70341
157-04-80 _ W83-7032	6 POWER LINES		310 20-68 V	v83-70568
POGO Crustal Magnetic Field Representation and Verification	Use of Thematic Mapper Data for Electric Transmission Corridor Analysis and Siting	cal Utility P	ROGRAMMING LANGUAGES Computational Methods and Applications	ın Fluid
677-45-06 W83-7054	2 677-60-19 W	83-70549	Dynamics	
POINTING CONTROL SYSTEMS Spacecraft Controls and Guidance	POWER SUPPLY CIRCUITS Power Systems Management and Distribution		505-31-01 V Mathematics for Engineering and Science	V83-70001
506 57-13 W83-7018		83-70179	505 31-83 V	V83-70016
Study of Large Deployable Reflector for Infrared ar Submillimeter Astronomy	506-55-79 W	83-70183	MPP Systems Software R & T 506 54-56 V	v83-70159
506-62-21 W83-7021			Automation Technology for Planning Teleopei	ration and
Solar Array Flight Experiment (SAFE) Dynamics & Contr Augmentation (Flights 1 and 2)	506-55-13 W	83-70166	Robotics 506-54-65 W	v83-70162
506-62-49 W83-7021	5 POWERED LIFT AIRCRAFT Powered Lift Propulsion Technology	P	ROJECT MANAGEMENT Automation of Space Transportation Systems	
POLAR ORBITS Gravity Probe - B		83-70069		v83-70217
188-78-41 W83-7039 POLAR REGIONS	PRECAMBRIAN PERIOD Early Crustal Genesis		Assessment of Ozone Perturbations 147-51-00 W	v83-70290
Polar Oceanography	153-09-40 W	83-70306	International Halley Watch	
161-40-00 W83-7034 POLARIMETERS	PRECESSION Gravity Probe - B		156-02-02 W STARPROBE - Advanced Technology Mana	V83-70318
X-Ray Astronomy	188-78-41 W	83-70392	Planning	-
188-46-59 W83-7038 Data Analysis	PRECIPITATION (METEUROLOGY)	P	188 78-38 V ROJECT PLANNING	v83-70390
385-38-01 W83-7045	Aviation Safety Severe Storm Hazards 505-45-03 W.	83-70085	Manned Lunar Base Study	
POLARIZATION (WAVES) Multifunction SAR Technology	Meteorological Parameter Extraction		153-06-40 W Extraterrestrial Materials Processing	v83-70302
506-54-27 W83-7015	7 146-65-00 W: Meteorological Observing System Development	83-70254	179-40-62 W	v83-70359
POLARIZATION CHARACTERISTICS New Techniques for Quantitative Analysis of SAR Image		83-70256	Climate Program Support 672-50-00 W	v83-70496
677-46-02 W83-7054		eorological	Climate Research Program Support	
POLISHING Advanced X Ray Astrophysics Facility (AXAF)		83-70261 P	672-50-06 W	v83-70497
159-46-01 W83-7033	1 Cloud Physics		The Search for Extraterrestrial Intelligence	
POLLUTION MONITORING Global Tropospheric Models	179-75-10 William Climate Observations	83-70363 P	199-50-62 W ROP-FAN TECHNOLOGY	/83 70439
176-10-00 W83-7034	9 672-40-00 W	83-70494	Propeller Research	100 700
Global Tropospheric Modeling of Trace Gas Distribution 176-10-00 W83-7035		tal Effects	505-40-32 W Advanced Turboprop Program	v83-70058
Development of Resonant Ionization Laser Spectroscopy for	in Metals and Composites		535-03-12 W	v83-70122
Tropospheric NOx Measurements 176-40-03 W83-7035	505-33-21 W	83-70020 P	ROPELLANT COMBUSTION Advanced Manned Vehicle Onboard Propulsion	Technology
POLLUTION TRANSPORT	Life Prediction for Engine Materials	83-70021	506-60-17 W	v83-70207
Global Tropospheric Models 176-10-00 W83-7034	Life Prediction for Structural Materials		ROPELLANT PROPERTIES Advanced Manned Vehicle Onboard Propulsion	Technology
Global Tropospheric Modeling of Trace Gas Distribution	1 505-33-23 W	83-70022	506-60-17 W	v83-70207
176-10-00 W83-7035 POLYIMIDES	506-53-23 W	83-70131	ROPELLANT STORAGE Advanced Thermal Control Technology for C	Croyogenic
Aircraft Fire Safety Materials Testing 505-45-17 W83-7009	Analysis and Design	83-70143	Propellant Storage	/83-70235
		n s. /(114.5	::::::::::::::::::::::::::::::::::::::	Ch. VIII - 1.01

Ground Operations Associated with	Special Flight	PSYCHOMOTOR PERFORMANCE		RADAR TRACKING	
Demonstrations 906-64-23	W83-70587	Medical Operations Longitudinal Studies 199-10-21	W83-70407	Geopotential Research Mission (GRM) GR/ Studies	AVSAI/MAGSA
PROPELLANT TRANSFER		PSYCHOPHYSIOLOGY		676-59-10	W83-70509
Ground Operations Associated with Demonstrations	Special Flight	Basic Mechanisms Underlying Space Moti 199-20-22	on Sickness W83-70415	RADAR TRANSMITTERS Communications TDRSS Follow-On/I	Intersatellite Link
906-64-23 PROPELLER DRIVE	W83-70587	PULSE COMMUNICATION		506-58-26	W83-70203
Advanced Turboprop Program		Satellite Communication Technology 310-20-38	W83-70561	X-Band Uplink Development 310-20-64	W83-70564
535-03-12 PROPELLER EFFICIENCY	W83-70122	PUMPS		RADIANCE Meteorological Parameter Extraction	
Propeller Research		Advanced Low Thrust Chemical Propi 506-60-25	ulsion Technology W83 70209	146-65-00	W83-70254
505-40-32 PROPELLER SLIPSTREAMS	W83-70058	PURIFICATION	***************************************	Numerical Analysis of Remote Sensing Da 146-66-01	ita W83-70255
Propeller Research		Bioseparation Processes 179-80-40	W83-70365	Spectroscopic Properties of the Stratosphe	ere
505-40-32 Advanced Turboprop-Installation Aerodyna	W83-70058	PUSHBROOM SENSOR MODES	VV63-70305	147-44-00 Cloud Properties from Satellite Radiances	W83-70289
535-03-11	W83-70121	High Resolution Laser Research	14/02 70154	672-20-09	W83-70492
PROPELLERS Computational Fluid Dynamics for Turborn	achinery	506-54-23 PYLON MOUNTING	W83-70154	RADIATION COUNTERS Acousto-Optic & Submillimeter Device Tec	chnology
505-31-02	W83-70002	Decoupler Pylon Flight Evaluation		506-54 16	W83-70151
Propeller Research 505-40-32	W83-70058	533-02-71 Decoupler Pylon Flight Demonstration	W83-70109	Planetary Instrument Definition 157-20-70	W83-70329
Advanced Turboprop-Installation Aerodyna	imics	533-02-73	W83-70110	Ultraviolet Detector Development	
535-03-11 Advanced Turboprop Program	W83-70121	PYLONS		188-41-24 Particle Astrophysics and Experiment	W83-70379 Definition Studies
535-03-12	W83-70122	Loads and Aeroelasticity 505-33-43	W83-70028	188-46-56	W83-70383
PROPRIOCEPTION Teleoperator Human Interface Technology		Decoupler Pylon Flight Evaluation		X-Ray Astronomy 188-46-59	W83-70387
506-57-25	W83-70191	533-02-71 Decoupler Pylon Flight Demonstration	W83-70109	RADIATION DAMAGE	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Basic Mechanisms Underlying Space Motil 199-20-22	on Sickness W83-70415	533-02-73	W83-70110	Composites for Advanced Space Systems 506-53-23	W83-7013
PROPRIOCEPTORS				Effects of Space Environment on Composit	tes
Space Motion Sickness 199-20-21	W83-70414	Q		506-53 25 Space Durable Composites and Thermal	W83-70132
PROPULSION SYSTEM CONFIGURATIONS		OULLITY CONTROL		506-53-29	W83-7013
Engine Systems Research 505-40-62	W83-70061	QUALITY CONTROL Image Processing Technology		Photovoltaic Research and Technology 506-55-42	W83-70170
Rotorcraft-Operating Problems		310-40-46	W83-70574	Advanced Technological Development Ge	neral Signal and
505-42-32 Powered Lift Propulsion Technology	W83-70066	QUANTITATIVE ANALYSIS Planetary Materials Laboratory and Analytic	tical Studies	Data Processing Electronics Solid State Deta 188-78-51	ectors W83-70393
505 43-02	W83-70069	152-02-40	W83-70294	RADIATION DETECTORS	
High-Speed Aerodynamics and Propulsion 505-43-23	Integration W83-70073	QUANTUM MECHANICS Surface Physics and Computational Chemis	stry	Advanced Technological Development Ge Data Processing Electronics Solid State Deta	
Supersonic Propulsion Integration Technological	ogy	506-53-11	W83-70127	188-78-51	W83-70393
505-43-42 Hypersonic Aeronautics Technology	W83-70077	QUARTZ CRYSTALS Development of Experiments and Hardware	for Solar Physics	RADIATION DOSAGE Radiation Effects and Protection	
505-43-81	W83-70080	Research		199-20-71	W83-70424
Hypersonic Propulsion Integration Technolo 505-43-82	ogy W83-70081	188-38-51 QUASARS	W83-70370	Biological Effects of Particle Radiation 199-20-72	W83-70425
Convertible Engine System Technology		Theoretical Studies of Galaxies Active Gal	lactic Nuclei and	Radiation Effects and Protection	
532-06-12 Advanced Low Thrust Chemical Propu	W83-70097	Quasi Stellar Objects 188 41-53	W83-70381	199-20-76 RADIATION EFFECTS	W83-70426
506-60-25	W83-70209			Composites for Advanced Space Systems	
High Energy Upper Stage 906-63-00	W83-70582	R		506-53-23 Space Durable Composites and Thermal	W83-70131 Control Surfaces
PROPULSION SYSTEM PERFORMANCE				506-53-29	W83-70135
Computational Facilities 505-37-32	W83-70054	RADAR ANTENNAS Antenna Systems Development		X-Ray Gamma-Ray and Neutron/Gamma- Planetary Exploration	Ray Methods for
Inlets and Nozzles		310-20-65	W83-70565	157-03-50	W83-70324
505-40-02 Controls and Instrumentation	W83-70055	RADAR ASTRONOMY High-Speed Signal Processing Research		Radiation Effects and Protection 199-20-71	W83-70424
505-40-52	W83-70060	310-30-70	W83-70570	Biological Effects of Particle Radiation	
Engine Systems Research 505-40-62	W83-70061	RADAR GEOLOGY New Techniques for Quantitative Analysis	s of SAR Images	199-20-72 Radiation Effects and Protection	W83-70425
Rotorcraft-Operating Problems		677-46-02	W83-70543	199-20-76	W83-70426
505-42-32 Convertible Engine System Technology	W83-70066	RADAR IMAGERY Data Systems Research and Technology		Developmental Biology 199-40-22	W83 70432
532-06-12	W83-70097	506-58-15	W83-70197	RADIATION HAZARDS	
Powered Lift Systems Technology - Harrie Program	r Flight Hesearch	SAR Data System Research and Developm 656-44-03	nent W83-70484	Radiation Effects and Protection 199-20-71	W83-70424
533-02-51	W83-70107	Multisensor Technique Development		Radiation Effects and Protection 199-20-76	W02 70426
Energy Efficient Engine Project 535-01-12	W83-70120	677-21-28 Land Resources Applied Research	W83-70516	RADIATION PRESSURE	W83-70426
Electric Propulsion Technology	W83-70168	677 21-29	W83-70517	Extended Atmospheres 154-80-80	W83-70316
506-55-22 OTV Propulsion Performance and Plume		Advanced Radar Concepts and Systems St 677 29-18	w83 70526	RADIATION PROTECTION	W03-70310
506-60-49 Flight Test of an Ion Auxiliary Propulsion	W83-70211	Remote Sensing Techniques for Geobotanic		Radiation Effects and Protection 199-20-71	W83-70424
542-05-12	W83-70248	of Chromium-Bearing Rock Types 677-42-05	W83-70537	Radiation Effects and Protection	W03-70424
PROTECTIVE COATINGS Electrically Conductive Thermal Control Coa	ot.o	Use of SAR for Geologic Mapping		199-20-76 RADIATION TOLERANCE	W83-70426
506-53-26	W83-70133	677-43-16 Topographic Mapping Methods	W83-70539	Biological Effects of Particle Radiation	
PROTEIN METABOLISM Muscle Alterations		677-43-17	W83 70540	199-20-72 Radiation Effects and Protection	W83-70425
199-20-41	W83-70418	SIR-A Data Analysis 677-43-18	W83-70541	199-20-76	W83-70426
PROTONS		New Techniques for Quantitative Analysis 677-46-02		RADIATIVE TRANSFER Climate Modeling with Emphasis on Aerosi	als
Gamma Ray Astronomy 188-46-57	W83-70386	ER SEASAT Digital SAR Processing	W83-70543	146-10-04	W83-70249
PROTOPLANETS Chemical Evolution		677-48-01	W83-70545	Remote Sensing 153-07-40	W83-70303
199-50-12	W83-70434	Spatial Radar Image Registration 677-48-03	W83-70546	Remote Sensing of Atmospheric Structure	
PROTOSTARS Formation Evolution and Stability of Pr	roto-Stellar Disks	RADAR MEASUREMENT		154-40-80 Theoretical Studies of Galaxies Active Gal.	W83-70312
153-01-60	W83-70298	Tropospheric Wind Measurement Assessme 146-72-04	w83-70260	Quasi Stellar Objects	
PROTOTYPES Mobile Satellite Experiment		Meteorological Observing System Developm		188-41-53 RADICALS	W83-70381
650-60-00	W83-70473	146-73-00 Meteorological Lidar Development	W83-70262	Upper Atmosphere Research	Reaction Rate
PROXIMITY Ground Operations Associated with	Special Flight	146-74-01	W83-70263	Measurements 147-21-00	W83-70277
Demonstrations		RADAR RECEIVERS Communications TDRSS Follow-On/In	itersatellite Links	Cosmic Chemistry Aeronomy Comets Gra	ins
906-64-23 PSYCHOACOUSTICS	W83-70587	506-58-26 RADAR RESOLUTION	W83 70203	154-75-80 RADIO ALTIMETERS	W83-70315
Community Response to Noise		Advanced Radar Concepts and Systems St		Digital Topographic Mapping	g Mission
505-35-13 PSYCHOLOGICAL EFFECTS	W83-70037	677-29-18	W83-70526	Requirements/Feasibility Study 677-29-12	W83-70522
Community Response to Noise		RADAR SCATTERING Ocean Advanced Studies		Digital Topographic Mapping	
505-35-13 Human Behavior and Performance	W83-70037	161-10-00 Land Cover Multisensor Analysis	W83-70332	Requirements/Feasibility Study 677-29-12	W83-70523
199-20-82	W83-70427	677-21-25	W83-70514	RADIO ANTENNAS	
Interdisciplinary Research 199-90-71	W83-70456	Airborne Radar Operations 677 47-03	W83-70544	Space Station Communication Technology 506-58-27	W83-70204
	, 0-100				

Orbiting VLBI Feasibility Study	RAMAN SPECTROSCOPY	REFLECTORS
159-41-03 W83-70330 Mobile Satellite Experiment	Acvtive and Passive Sensor Research 506-54-25 W83-70155	Advanced Space Structures Antenna Technology Development
650-60-00 W83-70473	Spectroscopic Properties of the Stratosphere 147-44-00 W83-70289	506-53-45 W83-70141
Space Communications Systems Antenna Technology 650-60-20 W83-70474	RAMJET MISSILES	Advanced Control Technology 506-57-15 W83-70186
Advanced Space Systems for Users of NASA Networks	High Speed (Super/Hypersonic) Technology 505-43-83 W83-70082	Multiple Beam Antenna Technology Development Program
310-20-46 W83-70563	RANDOM PROCESSES	for Large Aperture Deployable Reflectors 506-58-23 W83-70201
Antenna Systems Development 310-20-65 W83-70565	Theoretical Studies of Galaxies Active Galactic Nuclei and	Study of Large Deployable Reflector for Infrared and
RADIO ASTRONOMY	Quasi Stellar Objects 188-41-53 W83-70381	Submillimeter Astronomy 506-62-21 W83-70212
Multiple Beam Antenna Technology Development Program	RANGEFINDING	Stratospheric Research Balloon Laser In-Situ Sensor
for Large Aperture Deployable Reflectors 506-58-23 W83-70201	Advanced Earth Orbiter Radio Metric Technology Development	147-11-04 W83-70267 Antenna Systems Development
Infrared and Sub-Millimeter Astronomy	161-10-03 W83-70334	310-20-65 W83-70565
188-41-55 W83-70382	RAREFIED GAS DYNAMICS Shuttle Upper Atmosphere Mass Spectrometer (SUMS)	REFRACTORY MATERIALS
Radio Astronomy 196-41-73 W83-70400	506-63-37 W83-70224	High Temperature Engine Composites 505-33-32 W83-70024
The Search for Extraterrestrial Intelligence	High Resolution Accelerometer Package (HiRAP) Experiment	Structures Analysis and Synthesis
199-50-62 W83-70439 Antenna Systems Development	Development 506-63-43 W83-70228	506-53-51 W83-70142 Containerless Processing
310-20-65 W83-70565	RAWINSONDES	179-80-30 W83-70364
RADIO FREQUENCIES Technical Consultation Services	Verification and Analysis of Satellite Derived Products 146-71-00 W83-70257	REFRIGERATORS Advanced Thermal Control Technology for Croyogenic
643-10-01 W83-70466	RAYLEIGH SCATTERING	Propellant Storage
Spectrum and Orbit Utilization Studies 643-10-01 W83-70467	Spectroscopic Properties of the Stratosphere 147-44-00 W83-70289	506-64-25 W83-70235 Radio Systems Development
643-10-01 W83-70467 RADIO FREQUENCY INTERFERENCE	REACTION KINETICS	310-20-66 W83-70566
Advanced Space Systems for Users of NASA Networks	Burning Fundamentals & Heat Transfer 505-31-42 W83-70012	REGENERATION (ENGINEERING)
310-20-46 W83-70563 High-Speed Signal Processing Research	Upper Atmosphere Research Reaction Rate	Advanced Life Support Systems 199-60-12 W83-70441
310-30-70 W83-70570	Measurements 147-21-00 W83-70277	Food Requirements Production and Processing for CELSS
RADIO INTERFEROMETERS Orbiting VLBI Feasibility Study	147-21-00 W83-70277 Chemical Kinetics of the Upper Atmosphere	199-60-42 W83-70444 Waste Management for CELSS
159-41-03 W83-70330	147-21-03 W83-70278	199-60-52 W83-70445
RADIO NAVIGATION Radio Metric Technology Development	Photochemistry of the Upper Atmosphere 147-22-01 W83-70279	Systems Management Control and Ecological Considerations for CELSS
310-10-60 W83-70557	Data Survey and Evaluation	199-60-62 W83-70446
Space Systems and Navigation Technology	147-51-02 W83-70291 Cosmic Chemistry Aeronomy Comets Grains	REGENERATIVE FUEL CELLS
310-10-63 W83-70559 RADIO RECEIVERS	154-75-80 W83-70315	Orbital Energy Storage and Power Systems 506-55-57 W83-70176
Space Station Communication Technology	Kinetic Studies Involving CH302 HO2 and IO Radicals of	RELATIVISTIC THEORY
506-58-27 W83-70204 Radio Astronomy	Tropospheric Importance 176-30-01 W83-70351	Gravitational Wave Astronomy and Cosmology 188-41-22 W83-70378
196-41-73 W83-70400	REACTION TIME	RELATIVITY
RF Components for Satellite Communications Systems 650-60-22 W83-70476	Chemical Kinetics of the Upper Atmosphere 147-21-03 W83 70278	Gravity Probe - B 188-78-41 W83-70392
X-Band Uplink Development	REACTIVITY	RELAXATION (MECHANICS)
310-20-64 W83-70564	Upper Atmosphere Research - Reaction Rate Measurements	Fundamentals of Mechanical Behavior of Composite
Station Monitor and Control Technology 310-20-68 W83-70568	147-21-00 W83-70277	Matrices 506-53-15 W83-70129
RADIO RECEPTION	READOUT Ultraviolet Detector Development	RELAXATION METHOD (MATHEMATICS)
Radio Systems Development 310-20-66 W83-70566	188-41-24 W83-70379	Computer-Aided Design 505-37-13 W83-70050
RADIO RELAY SYSTEMS	REAL TIME OPERATION	RELAY SATELLITES
Advanced Space Systems for Users of NASA Networks	Flight Simulation Technology 505-35-33 W83-70041	Communications TDRSS Follow-On/Intersatellite Links
Advanced Space Systems for Users of NASA Networks 310-20-46 W83-70563 RADIO TRACKING	505-35-33 W83-70041 Controls and Instrumentation	506-58-26 W83-70203 RELIABILITY ENGINEERING
310-20-46 W83-70563 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research
310-20-46 W83-70563 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development	505-35-33 W83-70041 Controls and Instrumentation	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558
310-20-46 RADIO TRACKING	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMANENCE Experimental Magnetism
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMANENCE Experimental Magnetism 153-08-50 W83-70305
310-20-46	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMANENCE Experimental Magnetism 153-08-50 W83-70305 REMOTE CONTROL Automation Systems Research
310-20-46 RADIO TRACKING	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196 Network Monitor and Control Technology	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMANENCE Experimental Magnetism 153-08-50 W83-70305 REMOTE CONTROL Automation Systems Research 506-54-63 W83-70161
310-20-46	\$05-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196 Network Monitor and Control Technology 3 10-30-69 RECELEVERS W83-70569	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMANENCE Experimental Magnetism 153-08-50 W83-70305 REMOTE CONTROL Automation Systems Research 506-54-63 W83-70161 Manned Control of Remote Operations 506-57-23 W83-70190
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70568	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196 Network Monitor and Control Technology 310-30-69 RECEIVERS SERIES - Satellite Emission Range Inferred Earth Surveying	506-58-26
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology	\$05-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196 Network Monitor and Control Technology 3 10-30-69 RECELEVERS W83-70569	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMANENCE Experimental Magnetism 153-08-50 W83-70305 REMOTE CONTROL Automation Systems Research 506-54-63 W83-70161 Manned Control of Remote Operations 506-57-23 W83-70190
310-20-46	505-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70156 Data Systems Research and Technology 506-58-13 W83-70156 Network Monitor and Control Technology 310-30-69 RECEIVERS SERIES - Satellite Emission Range Inferred Earth Surveying 676-59-30 W83-70510 REDUCED GRAVITY Electrostatic Containerless Processing Technology	506-58-26
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 W83-70568	\$05-35-33	506-58-26 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 REMANENCE Experimental Magnetism 153-08-50 REMOTE CONTROL Automation Systems Research 506-54-63 Manned Control of Remote Operations 506-57-23 Teleoperator and Robotics System Analysis 506-64-23 Station Monitor and Control Technology 310-20-68 Teleoperator Maneuvering System W83-7058
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology	SOS-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-64-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196 Network Monitor and Control Technology 310-30-69 W83-70569 RECEIVERS SERIES - Satellite Emission Range Inferred Earth Surveying 676-59-30 W83-70510 REDUCED GRAVITY Electrostatic Containerless Processing Technology 179-20-56 W83-70358 Spherical Shell Technology Study 179-20-57 W83-70358	506-58-26
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-56-65 W83-70568	SOS-35-33 W83-70041 Controls and Instrumentation 505-40-52 W83-70060 Solid State & Optical Device Research 506-54-13 W83-70149 Sensor Research and Technology 506-54-26 W83-70156 Data Systems Research and Technology 506-58-13 W83-70196 Network Monitor and Control Technology 310-30-69 W83-70569 RECEIVERS SERIES - Satellite Emission Range Inferred Earth Surveying 676-59-30 W83-70510 REDUCED GRAVITY Electrostatic Containerless Processing Technology 179-20-56 W83-70358 Spherical Shell Technology Study 179-20-57 W83-70358 Commercial Materials Processing in Low-Gravity	506-58-26 RELIABILITY ENGINEERING Frequency and Timing Research 3 10-10-62 REMANENCE Experimental Magnetism 153-08-50 REMOTE CONTROL Automation Systems Research 506-54-63 Manned Control of Remote Operations 506-57-23 Teleoperator and Robotics System Analysis 506-64-23 Station Monitor and Control Technology 310-20-68 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology Planetary Instrument Definition 157-20-70 W83-70329	\$05.35.33	506-58-26
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 RADIO TRANSMITTERS Space Station Communication Technology 310-20-64 Station Monitor and Control Technology 310-20-68 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 W83-70177 Planetary Instrument Definition 157-20-70 W83-70329	SOS-35-33	506-58-26
## 83-70563 ## 84	\$05.35.33	506-58-26 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 REMARENCE Experimental Magnetism 153-08-50 REMOTE CONTROL Automation Systems Research 506-54-63 Manned Control of Remote Operations 506-57-23 Teleoperator and Robotics System Analysis 506-64-23 Station Monitor and Control Technology 310-20-68 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 Teleoperator Maneuvering System 906-75-00 REMOTE SENSING
RADIO TRACKING	SOS-35-33	506-58-26
310-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 9506-55-65 Planetary Instrument Definition 157-20-70 RADIOBIOLOGY Radiation Effects and Protection 199-20-71 Biological Effects of Particle Radiation 199-20-72 W83-7045	SOS-35-33	506-58-26 W83-70203
RADIO TRACKING	SOS-35-33	506-58-26
## RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03	SOS-35-33	506-58-26 W83-70203
A10-20-46 RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-68 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 X-Band Uplink Development 310-20-68 RADIO ACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 Planetary Instrument Definition 157-20-70 RADIOBIOLOGY Radiation Effects and Protection 199-20-72 Radiation Effects and Protection 199-20-72 Radiation Effects and Protection 199-20-76 RW83-70426	SOS-35-33	506-58-26 W83-70203 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 W83-70558 REMARENCE Experimental Magnetism 153-08-50 W83-70305 REMOTE CONTROL Automation Systems Research 506-54-63 W83-70161 Manned Control of Remote Operations 506-57-23 W83-70190 Teleoperator and Robotics System Analysis 506-64-23 W83-70234 Station Monitor and Control Technology 310-20-68 Teleoperator Maneuvering System 906-75-00 W83-70568 Teleoperator Maneuvering System 906-75-00 W83-70161 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 W83-70161 Teleoperator Maneuvering System 906-75-00 W83-70591 REMOTE SENSING Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 W83-70086 Acvitive and Passive Sensor Research 506-64-25 W83-70155
RADIO TRACKING	SOS-35-33	506-58-26 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 REMANENCE Experimental Magnetism 153-08-50 REMOTE CONTROL Automation Systems Research 506-54-63 Manned Control of Remote Operations 506-57-23 Teleoperator and Robotics System Analysis 506-64-23 Station Monitor and Control Technology 310-20-68 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 Teleoperator Maneuvering System 906-75-00 REMOTE SENSING Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 Acvitive and Passive Sensor Research 506-54-25 Sensor Research and Technology 506-54-26 Advanced Large Spacecraft Systems Analysis 506-62-23
## RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70348 ### RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 W83-70470 ### RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 **X-Band Uplink Development 310-20-64 **Station Monitor and Control Technology 310-20-68 ### RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 ### RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 ### RADIOACTIVE ISOTOPES ### Radiation Effects and Protection 199-20-71 ### Biological Effects of Particle Radiation 199-20-72 ### Radiation Effects and Protection 199-20-76 ### RADIOACTIVE ISOTOPES ### Radiation Effects and Protection 199-20-71 ### Biological Effects of Particle Radiation 199-20-72 ### Radiation Effects and Protection 199-20-75 ### RADIOACTIVE ISOTOPES ### RADIOACTIVE ISOTO	SOS-35-33	506-58-26 W83-70203
## RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70334 ### RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 W83-70470 ### RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 *## X-Band Uplink Development 310-20-64 W83-70204 *## Station Monitor and Control Technology 310-20-68 W83-70568 ### RADIO ACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 ### Planetary instrument Definition 157-20-70 W83-70329 ### Radiation Effects and Protection 199-20-72 ### Radiation Effects and Protection 199-20-72 ### Radiation Effects and Protection 199-20-72 ### Radiation Effects and Protection 199-20-75 ### RADIO ONLY STATE RADIATION ### W83-70424 ### W83-70425 ### RADIO ONLY STATE RADIATION ### W83-70426 ### W83-70425 ### W83-70426 ##	SOS-35-33	506-58-26 RELIABILITY ENGINEERING Frequency and Timing Research 310-10-62 REMANENCE Experimental Magnetism 153-08-50 REMOTE CONTROL Automation Systems Research 506-54-63 Manned Control of Remote Operations 506-57-23 Teleoperator and Robotics System Analysis 506-64-23 Station Monitor and Control Technology 310-20-68 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 Teleoperator Maneuvering System 906-75-00 REMOTE MANIPULATOR SYSTEM Automation Systems Research 506-54-63 Teleoperator Maneuvering System 906-75-00 REMOTE SENSING Clear Air Turbulence Studies Using Passive Microwave Radiometers 505-45-05 Acvitive and Passive Sensor Research 506-54-25 Sensor Research and Technology 506-54-26 Advanced Large Spacecraft Systems Analysis 506-62-23
310-20-46	SOS-35-33	506-58-26 W83-70203
## RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70334 ### RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 W83-70470 ### RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 *## X-Band Uplink Development 310-20-64 W83-70204 *## Station Monitor and Control Technology 310-20-68 W83-70568 ### RADIO ACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 ### Planetary instrument Definition 157-20-70 W83-70329 ### Radiation Effects and Protection 199-20-72 ### Radiation Effects and Protection 199-20-72 ### Radiation Effects and Protection 199-20-72 ### Radiation Effects and Protection 199-20-75 ### RADIO ONLY STATE RADIATION ### W83-70424 ### W83-70425 ### RADIO ONLY STATE RADIATION ### W83-70426 ### W83-70425 ### W83-70426 ##	SOS-35-33	506-58-26 W83-70203
310-20-46	SOS-35-33	506-58-26 W83-70203
## RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03	SOS-35-33	506-58-26 W83-70203
RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70334 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 W83-70470 Radio Systems Development 310-20-66 W83-70566 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 W83-70568 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 Planetary instrument Definition 157-20-70 W83-70177 Planetary instrument Definition 157-20-70 W83-70424 Biological Effects and Protection 199-20-71 W83-70424 Biological Effects and Protection 199-20-72 Radiation Effects and Protection 199-20-75 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-53-25 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-53-21 W83-70201 Millimeter/ Submillimeter Laboratory Spectroscopy 147-23-10 W83-70370 Monitoring Large Scale Total Primary Production and Descrification Processes with AVHRR Imagery	SOS-35-33	SO6-58-26 W83-70203
310-20-46	SOS-35-33	SO6-58-26 W83-70203
### RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03	SOS-35-33	SO6-58-26 W83-70203
RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70334 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 W83-70470 Radio Systems Development 310-20-66 W83-70566 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 X-Band Uplink Development 310-20-64 W83-70568 RADIO TRANSMITTERS Thermal to Electric Energy Conversion Technology 310-20-68 W83-70568 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 310-20-68 W83-70568 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 310-20-68 W83-70568 RADIOBIOLOGY Radiation Effects and Protection 199-20-71 W83-70329 RADIOBIOLOGY Radiation Effects of Particle Radiation 199-20-72 W83-70426 RADIOLYSIS Effects of Space Environment on Composites 506-53-25 W83-70132 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-58-23 W83-70201 Millimeter/ Submillimeter Laboratory Spectroscopy 147-23-10 W83-70201 Development of Experiments and Hardware for Solar Physics Research 188-38-51 W83-70370 Monitoring Large Scale Total Primary Production and Desertification Processes with AVHRR Imagery 199-30-07 W83-70429 Station Monitor and Control Technology	SOS-35-33	SO6-58-26 W83-70203
RADIO TRACKING	SOS-35-33	SO6-58-26 W83-70203
RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70334 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 W83-70470 Radio Systems Development 310-20-66 W83-70566 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 X-Band Uplink Development 310-20-64 Station Monitor and Control Technology 310-20-68 W83-70568 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 Planetary instrument Definition 157-20-70 W83-70177 Planetary instrument Definition 157-20-70 RADIOBIOLOGY Radiation Effects and Protection 199-20-71 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-75 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-53-25 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-53-21 Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-53-25 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-53-25 National Primary Production and Description Development of Experiments and Hardware for Solar Physics Research 188-38-51 W83-70263 Development of Experiments and Hardware for Solar Physics Research 188-38-51 W83-70429 Solar Irradiance Rocket Experiment 672-40-08 Station Monitor and Control Technology 310-20-68 RADIOMETERSOLUTION Renewable Resources Field Research and Spacecraft Data	SOS-35-33	SO6-58-26 W83-70203
RADIO TRACKING	SOS-35-33	SO6-58-26 W83-70203
RADIO TRACKING Advanced Earth Orbiter Radio Metric Technology Development 161-10-03 W83-70334 RADIO TRANSMISSION Propagation Studies and Measurements 643-10-03 Radio Systems Development 310-20-66 W83-70470 Radio Systems Development 310-20-66 W83-70566 RADIO TRANSMITTERS Space Station Communication Technology 506-58-27 W83-70204 X-Band Uplink Development 310-20-64 W83-70564 Station Monitor and Control Technology 310-20-68 W83-70568 RADIOACTIVE ISOTOPES Thermal to Electric Energy Conversion Technology 506-55-65 W83-70177 Planetary Instrument Definition 157-20-70 W83-70329 RADIOBIOLOGY Radiation Effects and Protection 199-20-71 W83-70424 Biological Effects of Particle Radiation 199-20-72 Radiation Effects and Protection 199-20-76 RADIOLYSIS Effects of Space Environment on Composites 506-53-25 W83-70132 RADIOMETERS Multiple Beam Antenna Technology Development Program for Large Aperture Deployable Reflectors 506-58-23 W83-70201 Millimeter/Submillimeter Laboratory Spectroscopy 147-23-10 W83-70283 Development of Experiments and Hardware for Solar Physics Research Monitoring Large Scale Total Primary Production and Desertification Processes with AVHRR Imagery 199-30-07 W83-70429 Station Monitor and Control Technology Station Monitor and Control Technology 310-20-68 RADIOMETERS W83-70568 RADIOMETERS W83-70429 Station Monitor and Control Technology 310-20-68 RADIOMETERS W83-70568 RADIOMETERS W83-70568 RADIOMETERS W83-70568	SOS-35-33	SO6-58-26 W83-70203

NEWOTE SENSORS				30302	0, mben
Critical Examination of Upper Stratospheric Measi	urements	Multifunction SAR Technology		Digital Topographic Mapping	Mission
	3-70288	· - ·	83-70157	Requirements/Feasibility Study 677-29-12	W83-70523
Remote Sensing 153-07-40 W8	3-70303	Global Weather Research - Advanced Most Temperature Sounder (AMTS)	sture and R	ETROREFLECTION	1103-70323
Remote Sensing of Atmospheric Structure	20240		83-70259	Stratospheric Research Balloon Laser In-Situ 147-11-04	Sensor W83-70267
154-40-80 W8 Giotto Dust Impact Detection System (DIDSY)	3-70312	Meteorological Lidar Development 146 74-01 W	83-70263 R	EUSABLE HEAT SHIELDING	W03-70207
156-03-07 W8	3-70323	Gas Correlation Wind Sensor	03-70203	Thermal Protection Systems Materials a	and Systems
Physical Oceanography 161-20-00 W8	3-70335	147-18-02 W	83-70275	Evaluation 506-53-31	W83-70136
Time Dependent Fields		X Ray Gamma-Ray and Neutron/Gamma-Ray M Planetary Exploration	lethods for	Thermal Protection Systems for Earth-To-Orbit	
161-20-11 W8 Ocean Optics	3-70338	157-03-50 W	83-70324	506-53-33 Advanced Carbon-Carbon Panels	W83-70137
161-30-00 W8	3-70339	Infrared Experiment Development		506-53-37	W83-70138
Ocean Applications Development Program 161-30-01 W8	3-70340	157-04-80 -W Research Mission Study - TOPEX	83-70325	Technology Requirements for Advanced Space 1 Systems	Fransportation
Lidar and Acoustics Applications to Ocean Pro	oductivity		83-70333	506-63-23	W83-70216
161-30-05 W8 Polar Oceanography	3-70341	Remote Sensor Development	02.70240	Shuttle Infrared Leeside Temperature Sensing 506-63-34	(SILTS) W83-70221
	3-70342	175-40-00 W Multisensor Technique Development	83-70348	OEX Thermal Protection Experiments	
Ocean Processes Branch Scientific Program Suppo 161-50-02 W8			83-70516	506-63-36 EUSABLE LAUNCH VEHICLES	W83-70223
	3-70345	Land Resources Applied Research	83-70517	Earth-to-Orbit Propulsion Life and Performand	e Technology
Techniques	2 70247	677 21-29 W Land Use and Techniques for Monitoring Large Sca		506-60-12 Orbital Transfer Vehicle Ground Operations Sti	W83-70206
175-20-00 W8: Global Tropospheric Models	3-70347	in Biomass	=	906-64-24	w83-70588
176-10-00 W8	3-70349		83-70518 R	EUSABLE ROCKET ENGINES	-
Monitoring Large Scale Total Primary Product Desertification Processes with AVHRR Imagery	tion and	Multispectral Linear Array for Remote Sensing 677-27-01 W	83-70520	Earth-to-Orbit Propulsion Life and Performand 506-60-12	e rechnology W83-70206
199-30-07 W8	3-70429	Soil/Snow Moisture Research and Assessmen	nt Mission	Reusable High Pressure Main Engine Technological	ogy
Global Ecology 199-30-31 W8:	3-70430	Study 677-29-05 W	83-70521	506-60-19 Variable Thrust OTV Propulsion Technology	W83-70208
Biosphere-Atmosphere Interactions in Wetland Eco	osystems	Digital Topographic Mapping	Mission	506-60-42	W83-70210
199-30-36 W8 Oceanic Pilot System	3-70431	Requirements/Feasibility Study	83-70522	OTV Propulsion Performance and Plume Ch 506-60-49	w83-70211
656-13-40 W8	3-70479	677 29-12 W- Digital Topographic Mapping		EYNOLDS NUMBER	
Information Sciences Research and Development 656-30-01 W8:	3-70481	Requirements/Feasibility Study	02 70522	F-4C Spanwise Blowing Flight Investigations 533-02-31	W83-70103
SAR Data System Research and Development	3-70461	677-29-12 W SMIRR Data Analysis	83-70523 R	EYNOLDS STRESS	1103-70103
	3-70484	677-41-19 W	83-70534	Test Methods and Instrumentation 505-31-51	W83-70013
Advanced Technology Global Resources Network 656-44-06 W8:	3-70485	Geological Applications of New Remote Techniques	Sensing R	HEOLOGY	1103-70013
Climate Observations 672 40-00 W8:	3-70494	677-41-23 W	83-70535	Regional Crustal Deformation 676-10-10	W83-70506
Climate Research Program Support	3-70494	REMOTELY PILOTED VEHICLES Highly Maneuverable Aircraft Technology Flight	Research R	IBS (SUPPORTS)	VV63-70500
	3-70497	533-03-11 W	83-70114	Advanced Space Structures Antenna	Technology
SERIES - Satellite Emission Range Inferred Earth S 676-59-30 W8:	3-70510	ENAL FUNCTION Fluid and Electrolyte Change		Development 506-53-45	W83-70141
Land Cover Multisensor Analysis		199-20-61 W	83-70422 R	ING STRUCTURES	
677-21-25 W8: Thematic Mapper Simulator Land Resources Si	3-70514 tudies in	ENDEZVOUS Teleoperator Maneuvering System		Asteroids 196-41-76	W83-70402
Western Ecozones		906-75-00 W	83-70591 R	ISK	
677-21-26 W8: Multisensor Technique Development	3-70515	EPRODUCTION (BIOLOGY) Developmental Biology		Space Station Communication Technology 506-58-27	W83-70204
677-21-28 W8	3-70516		83-70432	Bone Alterations	
Land Resources Applied Research 677-21-29 W8:	3-70517	ESCUE OPERATIONS Research Airport Operation		199-20-32 Biological Effects of Particle Radiation	W83-70417
Land Use and Techniques for Monitoring Large Scale			83-70119	199-20-72	W83-70425
in Biomass 677-21-30 W8:	3-70518	ESEARCH AIRCRAFT	R	OBOTS Automation Systems Research	
Hydrologic Information Extraction Technique Deve	elopment	RSRA Flight Research/Rotors 532-03-11 W	83-70095	506-54-63	W83-70161
677-22-27 W8: Soil/Snow Moisture Research and Assessment	3-70519	Flight Experiments Support		Automation Technology for Planning Teleop Robotics	peration and
Study		532-07-11 Wi Advanced Fighter Aircraft (F-15)	83-70099	506-54-65	W83-70162
677-29-05 W8: Space Station Resource Observations Payload Stud	3-70521	533-02-21 W	83-70102	Automation Research and Technology for Near- Operations	Earth Mission
	3-70524	Integrated Research Aircraft Control T (INTERACT)	echnology	506-54-66	W83-70163
Luminescence Detector from Space 677-29-22 W8:	3-70527	533-02-41 W	83-70105	Teleoperator and Robotics System Analysis 506-64-23	W83-70234
Improved Rock Type Discrimination	3-70527	Highly Maneuverable Aircraft Technology Flight 533-03-11 Wi	Research 83-70114	Teleoperations and Cryogenic Fluid Manageme	ent
	3-70529	ESEARCH FACILITIES		506-64-29 OCKET ENGINE DESIGN	W83-70238
Hydrothermal Ore System Detection in Partially Ve Mountainous Terrain	egerared	Human Factors Facilities Operations 505-35-01 W.	83-70036	Earth-to-Orbit Propulsion Life and Performance	e Technology
677-41-13 W8	3-70530	JSC General Operations - Geophysics & Geochem	nistry	506-60-12	W83-70206
High Spectral Resolution Techniques for Geologic 677-41-14 W8:	Mapping 3-70531	153-10-40 William Operational Laboratory	83-70307	Advanced Manned Vehicle Onboard Propulsio 506-60-17	W83-70207
Oil and Gas Test Case Study		199-10-12 W	83-70406	Reusable High Pressure Main Engine Technolo	
677-41-16 W8: Chromite Test Case Study	3-70532	ESEARCH MANAGEMENT Assessment of Ozone Perturbations		506-60-19 Variable Thrust OTV Propulsion Technology	W83-70208
677-41-17 W8:	3-70533	147-51-00 W	83-70290	506-60 42	W83-70210
SMIRR Data Analysis 677-41-19 W8:	3-70534	JSC General Operations Support - Planetary Mate		OCKET ENGINES Electric Propulsion Technology	
Geological Applications of New Remote		JSC General Operations - Geophysics & Geochem		506-55-22	W83-70168
Techniques 677-41-23 W8:	3-70535	153-10-40 Wi MPS AR&DA Support	83-70307 R	OCKET EXHAUST Advanced Low Thrust Chemical Propulsio	n Technology
Use of TM for the Detection of Mineralization in V	egetated		83-70360	506-60-25	W83-70209
Terrain Through Inference of Geobotanical Parameters 677-42-04 W8:	s 3-70536	Geodynamics Investigations Support 676-01-01 W	83-70505	OTV Propulsion Performance and Plume Ch 506-60-49	w83-70211
Remote Sensing Techniques for Geobotanical Discri		ESIN MATRIX COMPOSITES	63-70505 A	OCKET FLIGHT	
of Chromium-Bearing Rock Types 677-42-05 W8:	3-70537	Fire Resistant Composites		Solar Irradiance Rocket Experiment 672-40-08	W83-70495
Geobotanical Mapping in the Eastern United States		505-33-31 Wi High Temperature Engine Composites	83-70023 R	OCKET NOZZLES	***************************************
	3-70538	505-33-32 Wi	83-70024	Variable Thrust OTV Propulsion Technology	W02 70210
Use of SAR for Geologic Mapping 677-43-16 W8:	3-70539	Composites for Airframe Structures 505-33-33 Wi	83-70025 R	506-60-42 OCKET SOUNDING	W83-70210
Topographic Mapping Methods		Fundamentals of Mechanical Behavior of (Verification and Analysis of Satellite Derived P	
677-43-17 W8: SIR-A Data Analysis	3-70540	Matrices 506-53-15 W	83-70129 g	146-71-00 OCKET-BORNE INSTRUMENTS	W83-70257
	3-70541	Composites for Advanced Space Systems		X-Ray Astronomy	
New Techniques for Quantitative Analysis of SAF	R Images	506-53-23 W	83-70131	188-46-59	W83-70388
677-46-02 W8: Airborne Radar Operations	3-70543	ESINS Composites for Airframe Structures		Sounding Rocket Experiments 879-11-38	W83-70551
	3-70544	505-33-33 Wi	83-70025	Sounding Rockets Experiments (Astronomy)	
ER SEASAT Digital SAR Processing		ESOLUTION Meteorological Parameter Extraction		879-11-41	W83-70552
677-48-01 W83 Remote Sensing Applications for Facility Site Selec	3-70545	146-65-00 W	83-70254	Sounding Rocket Experiments (High Energy 879-11-46	Astrophysics) W83-70553
Waste Disposal Impact Assessment		Renewable Resources Field Research and Space Analysis	craft Data R	OCKS	
677-60-15 W8: REMOTE SENSORS	3-70548	677-21-24 W	83-70513	Luminescence Detector from Space 677-29-22	W83-70527
High Resolution Laser Research		Digital Topographic Mapping Requirements/Feasibility Study	Mission	Improved Rock Type Discrimination	
	3-70154		83-70522		W83-70529

Chromite Test Case Study		Gulf of Mexico Circulation Studies		Oceanic Research Support Activities	
677-41-17	W83-70533	161-20-10 Time Dependent Fields	W83-70337	161-50-00	W83-70344
ROTARY WING AIRCRAFT Engine Systems Research		161-20-11	W83-70338	SEA ROUGHNESS Altimeter Time Dependent Current Studies	
505-40-62 Operational Problems Fireworthiness and Cra	W83-70061	Ocean Optics 161-30-00	W83-70339	161-20-07 SEA TRUTH	W83-70336
505-45-11	W83-70088	Ocean Applications Development Program 161-30-01	W83-70340	Gulf of Mexico Circulation Studies	W83-70337
Convertible Engine System Technology 532-06-12	W83-70097	Development of New Remote Data		161-20-10 Time Dependent Fields	
ROTARY WINGS		Techniques 175-20-00	W83-70347	161-20-11 SEALS (STOPPERS)	W83-70338
Rotorcraft Aeromechanics and Configurations 505-42-11	W83-70064	Global Tropospheric Models 176-10-00	W83-70349	Variable Thrust OTV Propulsion Technology	W00 70310
Rotorcraft Airframe Systems	14/02 70065	Solar Physics Data Analysis and Operations	S	506-60-42 SEASAT PROGRAM	W83-70210
505-42-23 RSRA Flight Research/Rotors	W83-70065	385-38-01 Climate Observations	W83-70460	Coupled Active Passive Sea Ice Analysis 161-40-02	W83-70343
532-03-11 Rotorcraft Systems Integration	W83-70095	672-40-00 Climate Program Support	W83-70494	ER SEASAT Digital SAR Processing	
532-06-11	W83-70096	672-50-00	W83-70496	677-48-01 SEASAT SATELLITES	W83-70545
ROTATION OEX-Advanced Autopilot		SERIES - Satellite Emission Range Inferred 676-59-30	Earth Surveying W83-70510	Altimeter Time Dependent Current Studies 161-20-07	W83-70336
506-63-42 Multimode Acoustic Research	W83-70227	Land Use and Techniques for Monitoring Lar in Biomass		SELENOLOGY	***************************************
179-15-20	W83-70355	677-21-30	W83-70518	Planetary Materials Analysis 152-01-40	W83-70293
ROTOR AERODYNAMICS Rotorcraft Aeromechanics and Configurations		Geobotanical Mapping in the Eastern Unite 677-42-07	ed States W83-70538	SEMICONDUCTOR DEVICES Advanced Technological Development Gene	ral Signal and
505-42-11	W83-70064	Topographic Mapping Methods		Data Processing Electronics Solid State Detec	tors
RSRA Flight Research/Rotors 532-03-11	W83-70095	677-43-17 SATELLITE SOUNDING	W83-70540	188-78-51 SEMICONDUCTOR LASERS	W83-70393
Rotorcraft Systems Integration 532-06-11	W83-70096	Meteorological Satellite Data Research 146-60-00	W83-70251	Solid State & Optical Device Research	14/00 70140
RUNWAY CONDITIONS	7000	Meteorological Parameter Extraction	W83-70251	506-54-13 SEMICONDUCTORS (MATERIALS)	W83-70149
Aircraft Landing Dynamics 505-45-23	W83-70092	146-65-00 Verification and Analysis of Satellite Derive	W83-70254	Solid State & Optical Device Research 506-54-13	W83-70149
RURAL LAND USE		146-71-00	W83-70257	Photovoltaic Research and Technology	
Use of Thematic Mapper Data for Ele Transmission Corridor Analysis and Siting	ctrical Utility	Severe Storms and Local Weather Researc 175-13-00	h W83-70346	506-55-42 Solar Cell Research	W83-70170
677-60-19	W83-70549	SATELLITE TRACKING		506-55-43	W83-70171
_		Advanced Earth Orbiter Radio Met Development	tric Technology	Multi-KW Solar Arrays 506-55-49	W83-70173
S		161-10-03 SATELLITE TRANSMISSION	W83-70334	Power Systems Management and Distribution 506-55-72	w83-70179
SAFETY MANAGEMENT		Communications TDRSS Follow-On/Ir		Crystal Growth in Space	
Engine Systems Facilities Operations 505-40-70	W83-70062	506-58-26 Technical Consultation Services	W83-70203	542-03-30 Crystal Growth Research	W83-70246
High-Speed Wind Tunnel Operations		643-10-01	W83-70466	179-80-70	W83-70369
505-43-61 SAMPLES	W83-70079	New Application Studies 643-10-02	W83-70468	SENSORY FEEDBACK Manned Control of Remote Operations	
JSC General Operations Support - Planetary I	Materials	SATELLITE-BORNE INSTRUMENTS Communications TDRSS Follow-On/Ir	atarantallita Links	506-57-23	W83-70190
152-05-40 Sample Bank	W83-70297	506-58-26	W83-70203	SENSORY PERCEPTION Piloted Simulation Technology	
199-70-32	W83-70449	Verification and Analysis of Satellite Derive 146-71-00	ed Products W83-70257	505-35-31 SEPARATED FLOW	W83-70040
SAMPLING Planetary Materials Analysis		Global Weather Research - Microwave F	Pressure Sounder	Viscous Flows	
152-01-40 SANITATION	W83-70293	146-72-01 Global Weather Research Advanced	W83-70258 I Moisture and	505-31-11 Aerodynamics/Propulsion Integration	W83-70004
Advanced Life Support Systems		Temperature Sounder (AMTS) 146-72-02		505-45-43	W83-70093
199-60-11 SATELLITE ANTENNAS	W83-70440	Meteorological Lidar Development	W83-70259	SEPARATORS Electrochemical Energy Conversion and Stor	age
High Resolution Laser Research	W83-70154	146-74-01 Gas Correlation Wind Sensor	W83-70263	506-55-52 SERPENTINE	W83-70174
506-54-23 Multifunction SAR Technology		147-18-02	W83-70275	Remote Sensing Techniques for Geobotanica	I Discrimination
506-54-27 Satellite Communications Research and Techn	W83-70157	Remote Sensor Development 175-40-00	W83-70348	of Chromium-Bearing Rock Types 677-42-05	W83-70537
506-58-22	W83-70200	Long Duration Life Sciences Satellite Pi 199-80-42	rogram Definition W83-70452	SERVICE LIFE	
Multiple Beam Antenna Technology Develops for Large Aperture Deployable Reflectors	ment Program	Satellite Communication Technology		Life Prediction for Engine Materials 505-33-22	W83-70021
506-58-23 Advanced Large Spacecraft Systems Analysis	W83-70201	310-20-38 SATELLITE-TO-SATELLITE TRACKING	W83-70561	Power Transfer Research 505-40-42	W83-70059
506-62-23	W83-70213	GRAVSAT Study		Solar Cell Research	
Orbiting VLBI Feasibility Study 159-41-03	W83-70330	676-40-01 SATURN (PLANET)	W83-70508	506-55-43 Earth-to-Orbit Propulsion Life and Performal	W83-70171 nce Technology
Space Communications Systems Antenna Tec	hnology	Remote Sensing of Atmospheric Structure 154-40-80	W83-70312	506-60-12	W83-70206
650-60-20 Advanced Communications Technology Sa	W83-70474 itellite (ACTS)	Atomic and Molecular Properties of Planet		Reusable High Pressure Main Engine Techno 506-60 19	W83-70208
System Studies	W83-70478	Constituents 154-50-80	W83-70313	SERVOCONTROL Teleoperator and Robotics System Analysis	
650-60-26 Advanced Space Systems for Users of NA	SA Networks	Planetary Infrared Imaging 196-41-77		506-64 23	W83-70234
310-20-46 SATELLITE DESIGN	W83-70563	SATURN RINGS	W83-70403	SERVOME CHANISMS Infrared Imagery of Shuttle	
Gravity Probe - B	W83-70392	Planetary Infrared Imaging 196-41-77	W83-70403	506-63-35 Antenna Systems Development	W83-70222
188-78-41 SATELLITE INSTRUMENTS	VV83-70392	SCALE EFFECT		310-20-65	W83-70565
Absolute Solar Flux and Variability 673-15-00	W83-70501	F-4C Spanwise Blowing Flight Investigation 533-02-31	ns W83-70103	SEX FACTOR Longitudinal Studies	
Correlative Measurement Improvements		SCANNERS Ocean Optics		199-10 22	W83-70408
673-18-00 Superconducting Gravity Gradiometer	W83-70502	161-30-00	W83-70339	SHAPE CONTROL Spacecraft Controls and Guidance	
676-59-33	W83-70511	SCATHA SATELLITE Space Plasma Data Analysis		506-57-13 SHEAR FLOW	W83-70185
SATELLITE NETWORKS Applications Experiments Program Support		385-36-01	W83-70458	Viscous Drag Reduction and Control	
646-41-02 Mobile Satellite Experiment	W83-70472	SCATTEROMETERS Gulf of Mexico Circulation Studies		505-31 13 SHEAR LAYERS	W83-70005
650-60-00	W83-70473	161-20-10	W83-70337	Viscous Drag Reduction and Control	
Communications Laboratory for Transponder and Satellite Network Evaluation	Uevelopment	Time Dependent Fields 161-20 11	W83-70338	505-31-13 SHEAR STRENGTH	W83-70005
650-60-23	W83-70477	Land Cover Multisensor Analysis		Fire Resistant Composites	W83-70023
Frequency and Timing Research 310-10-62	W83-70558	677-21-25 Airborne Radar Operations	W83-70514	505-33 31 SHOCK LOADS	**03-70023
Satellite Communication Technology 310-20-38	W83-70561	677-47-03	W83-70544	Experimental Magnetism 153-08-50	W83-70305
SATELLITE OBSERVATION		SCENE ANALYSIS FILE Flight ExperimentsAnalysis and Supp	port	SHOCK TUBES	
Meteorological Satellite Data Research and 146-61-00	d Applications W83-70252	542-03-14	W83-70243	Thermo-Gasdynamic Test Complex 506-51 41	W83-70126
Atmospheric Processes Experiments and Syst	ems	SCHUMANN-RUNGE BANDS Solar Flux in Upper Atmosphere		SHOCK WAVES	
147-10-03 Upper Atmosphere Research - Satellite Data	W83-70265 Analysis	147-15-00	W83-70273	Test Methods and Instrumentation 505-31-51	W83-70013
147-41-00 Critical Examination of Upper Stratospheric !	W83-70287	SEA ICE Polar Oceanography		SHORT HAUL AIRCRAFT Propeller Research	
147-43-00	W83-70288	161-40-00	W83-70342	505-40 32	W83-70058
O-con Advanced Couding		Coupled Active Passive Sea Ice Analysis		Propulsive-Lift Technology - QSRA Flight Ex	periments
Ocean Advanced Studies 161-10-00	W83-70332	161-40-02	W83-70343	533-02-50	W83-70106

SHUTTLE DERIVED VEHICLES	Solar Array Flight Experiment (SAFE) Dynamics & Control	Ground-Based Observations of the Sun 188-38-52 W83-70374
Advanced Space Transportation Systems Ground Operations	Augmentation (Flights 1 and 2) 506-62-49 W83-70215	Structure and evolution of Solar Magnetic Fields (Laboratory
906-64-21 W83-70585 Advanced Transportation Shuttle Derived Vehicles (SDV)	Shuttle Operational Flight Test of a Large Solar Array 542-03-04 W83-70242	& Theory for Solar Physics) 188-38-53 W83-70375
906-65-00 W83-70589 SIGNAL ANALYSIS	SOLAR ATMOSPHERE	SOLAR MAXIMUM MISSION
Long Wavelength Subsurface Sounder	Development of Experiment and Hardware 188-38-51 W83-70371	Ground-Based Observations of the Sun 188-38-52 W83-70374
677-29-23 W83-70528 High-Speed Signal Processing Research	Experiment Development - Laboratory and Theoretical Solar	Data Analysis 385-38-01 W83-70459
310-30-70 W83-70570 SIGNAL ENCODING	Physics 188-38-53 W83-70376	Solar Irradiance Rocket Experiment
Mobile Satellite Experiment	Variability and Trends in Stratospheric Ozone the Siddle	672-40-08 W83-70495 SOLAR MESOSPHERE EXPLORER
650-60-00 W83-70473 Satellite Switching and Processing Systems	Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504	Absolute Solar Flux and Variability 673-15-00 W83-70501
650-60-21 W83-70475	SOLAR BLANKETS Photovoltaic Research and Technology	SOLAR POWER SATELLITES
Satellite Communication Technology 310-20-38 W83-70561	506-55-42 W83-70170	Advanced Radiant Energy Conversion 506-55-13 W83-70166
Communications Systems Technology Development 310-20-67 W83-70567	High Performance Solar Array Research and Technology 506-55-45 W83-70172	SOLAR RADIATION High Energy Astrophysics Data Analysis
SIGNAL PROCESSING	SOLAR CELL CALIBRATION FACILITY	385-46-01 W83-70464
Test Methods and Instrumentation 505-31-51 W83-70013	Space Calibration of Solar Cells 542-03-20 W83-70244	SOLAR RADIO BURSTS Solar Physics Data Analysis and Operations
Advanced Technological Development General Signal and Data Processing Electronics Solid State Detectors	SOLAR CELLS Photovoltaic Research and Technology	385-38-01 W83-70460 SOLAR SPECTRA
188-78-51 W83-70393	506-55-42 W83-70170	Experiment Development - Laboratory and Theoretical Solar
The Search for Extraterrestrial Intelligence 199-50-62 W83-70439	Solar Cell Research 506-55-43 W83-70171	Physics 188-38-53 W83-70376
Satellite Switching and Processing Systems 650-60-21 W83-70475	High Performance Solar Array Research and Technology 506-55-45 W83-70172	Sounding Rocket Experiments 879-11-38 W83-70551
Satellite Communication Technology	Space Calibration of Solar Cells	SOLAR SPECTROMETERS Sounding Rocket Experiments
High-Speed Signal Processing Research	542-03-20 W83-70244 SOLAR CONSTANT	879-11-38 W83-70551
310-30-70 W83-70570 SILICATES	Solar Irradiance Rocket Experiment 672-40-08 W83-70495	SOLAR SYSTEM Planetary Materials Analysis
Research of the use of Space Resources 179-46-20 W83-70361	Absolute Solar Flux and Variability	152-01-40 W83-70293
SIMULATION	673-15-00 W83-70501 SOLAR CORONA	Studies of the Distribution of Elements and Mineral Phases Among Meteorites
Interagency and Industrial Assistance and Testing 505-43-33 W83-70076	Studies of the Distribution of Elements and Mineral Phases Among Meteorites	152-03-60 W83-70295 Formation Evolution and Stability of Proto-Stellar Disks
Advanced Transport Operating Systems 534-04-13 W83-70118	152-03-60 W83-70295	153-01-60 W83-70298 Planetary Petrology
Automation Systems Research	Formation Evolution and Stability of Proto-Stellar Disks 153-01-60 W83-70298	153-02-40 W83-70299
506-54-63 W83-70161 Experimental Impact Cratering	Development of Solar Experiments and Hardware 188-38-51 W83-70372	Chemical Evolution 199-50-12 W83-70434
153-08-40 W83-70304 Communications Laboratory for Transponder Development	Structure and evolution of Solar Magnetic Fields (Laboratory & Theory for Solar Physics)	Solar System Environments 199-50-42 W83-70437
and Satellite Network Evaluation 650-60-23 W83-70477	188-38-53 W83-70375	SOLAR TEMPERATURE
SINGLE CRYSTALS	Experiment Development - Laboratory and Theoretical Solar Physics	Sounding Rocket Experiments 879-11-38 W83-70551
Surface Physics and Computational Chemistry 506-53-11 W83-70127	188-38-53 W83-70376 Advanced Mission Study - Solar X-Ray Pinhole Satellite and	SOLAR TERRESTRIAL INTERACTIONS Extended Atmospheres
Crystal Growth Research 179-80-70 W83-70369	Long Focal Length Coronagraph	154-80-80 W83-70316 Global Climate Model Development and Applications
SIS (SEMICONDUCTORS)	188-78-38 W83-70391 Data Analysis	672-30-00 W83-70493
Acousto-Optic & Submillimeter Device Technology 506-54-16 W83-70151	385-38-01 W83-70459 Sounding Rocket Experiments	SOLAR WIND Planetary Aeronomy Theory and Analysis
SITE SELECTION Remote Sensing Applications for Facility Site Selection and	879-11-38 W83-70551	154-60-80 W83-70314 Extended Atmospheres
Waste Disposal Impact Assessment	SOLAR CYCLES Structure and evolution of Solar Magnetic Fields (Laboratory	154-80 80 W83-70316
677-60-15 W83-70548 Use of Thematic Mapper Data for Electrical Utility	& Theory for Solar Physics) 188-38-53 W83-70375	Development of Solar Experiments and Hardware 188-38-51 W83-70372
Transmission Corridor Analysis and Siting 677-60-19 W83-70549	Absolute Solar Flux and Variability 673-15-00 W83-70501	Ground-Based Observations of the Sun 188-38-52 W83-70374
SKIN FRICTION Viscous Drag Reduction and Control	SOLAR ELECTRIC PROPULSION Electric Propulsion Thruster Subsystem R&T	Imaging Studies of Comets
505-31-13 W83-70005	506-55-25 W83-70169	196-41-52 W83-70395 Solar and Heliospheric Physics Data Analyses
SNOW Planetary Clouds Particulates and Ices	SOLAR ENERGY CONVERSION Advanced Radiant Energy Conversion	385-38-01 W83-70461
154-30-80 W83-70311 SNOW COVER	506-55-13 W83-70166 Photovoltaic Research and Technology	SOLAR X-RAYS Advanced Mission Study - Solar X-Ray Pinhole Satellite and
FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243	506-55-42 W83-70170	Long Focal Length Coronagraph 188-78-38 W83-70391
Hydrologic Information Extraction Technique Development	Solar Cell Research 506-55-43 W83-70171	SOLID LUBRICANTS
677-22-27 W83-70519 Soil/Snow Moisture Research and Assessment Mission	Multi-KW Solar Arrays 506-55-49 W83-70173	Non-Destructive Evaluation and Tribology 506-53-12 W83-70128
Study 677-29-05 W83-70521	Space Energy Conversion Support 506-55-70 W83-70178	SOUD STATE DEVICES
SODIUM	SOLAR FLARES	Satellite Communications Research and Technology 506-58-22 W83-70200
Optical Astronomy 196-41-71 W83-70399	Structure and evolution of Solar Magnetic Fields (Laboratory & Theory for Solar Physics)	SOLIDIFICATION Solidification Processes
SOIL MAPPING Land Resources Applied Research	188-38-53 W83-70375 Experiment Development - Laboratory and Theoretical Solar	179-80-60 W83-70367
677-21-29 W83-70517	Physics	Crystal Growth Processes 179-80-70 W83-70368
Geobotanical Mapping in the Eastern United States 677-42-07 W83-70538	188-38-53 W83-70376 Solar Physics Data Analysis and Operations	SOLITARY WAVES
SOIL MOISTURE Climate Observations	385-38-01 W83-70460 SOLAR FLUX	Gravitational Wave Astronomy and Cosmology 188-41-22 W83-70378
672-40-00 W83-70494 Multisensor Technique Development	Upper Atmosphere Research - Field Measurements	SOMALIA Altimeter Time-Dependent Current Studies
677-21-28 W83-70516	147-12-00 W83-70269 Solar Flux in Upper Atmosphere	161-20-07 W83-70336
Soil/Snow Moisture Research and Assessment Mission Study	147-15-00 W83-70273 Climate Observations	SONAR Lidar and Acquistics Applications to Ocean Productivity
677-29-05 W83-70521 SOILS	672-40-00 W83-70494	161-30-05 W83-70341 SOUNDING
Hydrologic Information Extraction Technique Development	Absolute Solar Flux and Variability 673-15-00 W83-70501	Long Wavelength Subsurface Sounder
677-22-27 W83-70519 SOLAR ACTIVITY	Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations	677-29-23 W83-70528 SOUNDING ROCKETS
Data Analysis 385-38-01 W83-70459	673-41-00 W83-70504 SOLAR FLUX DENSITY	Absolute Solar Flux and Variability 673-15-00 W83-70501
SOLAR ACTIVITY EFFECTS Planetary Aeronomy Theory and Analysis	Development of Experiments and Hardware for Solar Physics	Correlative Measurement Improvements
154-60-80 W83-70314	Research 188-38-51 W83-70370	673-18-00 W83-70502 Sounding Rocket Experiments
SOLAR ARRAYS Photovoltaic Research and Technology	SOLAR INSTRUMENTS Ground-Based Observations of the Sun	879-11-38 W83-70551
506-55-42 W83-70170 High Performance Solar Array Research and Technology	188-38-52 W83-70373	Sounding Rockets Experiments (Astronomy) 879-11-41 W83-70552
506-55-45 W83-70172 Multi-KW Solar Arrays	SOLAR MAGNETIC FIELD Development of Experiments and Hardware for Solar Physics	Sounding Rocket Experiments (High Energy Astrophysics)
506-55-49 W83-70173	Research 188-38-51 W83-70370	879-11-46 W83-70553 SOUTHERN CALIFORNIA
Spacecraft Power Systems R & T	Ground-Based Observations of the Sun	Oil and Gas Test Case Study
506-55-75 W83-70180	188-38-52 W83-70373	677-41-16 - W83-70532

Multiple Beam Antenna Technology Developn		Attit
for Large Aperture Deployable Reflectors	ent Program	310-10 Radi
506-58-23	W83-70201	310-10
Space Station Communication Technology 506-58-27	W83-70204	Spac 310-10
Spectrum and Orbit Utilization Studies 643-10-01	W83-70467	X-Ba 310-20
New Application Studies 643-10-02	W83-70468	SPACE O
Propagation Studies and Measurements		156-02
643-10-03 SPACE DEBRIS	W83-70470	UV a
Hypervelocity Impact Resistance of Compo 506-53-27	site Materials W83-70134	Dete 196-41
Orbital Services 906-75-00	W83-70592	Aste 196-41
SPACE DETECTION AND TRACKING SYSTEM	W83-70592	Plan
Station Monitor and Control Technology 310-20-68	W83-70568	196-41 SPACE F
SPACE ENVIRONMENT SIMULATION Man-Machine Engineering Requirements for	or Data and	Spac 506-55
Functional Interfaces	W83-70447	Sola Augme
	ment (SADE)	506-62
906-55-00 SPACE ERECTABLE STRUCTURES	W83-70580	1mpr 157-04
Advanced Space Structures 506-53-43	W83-70140	Spac 385-36
Advanced Space Structures Antenna	Technology	SPACE F
Development 506-53-45	W83-70141	506-53
SPACE EXPLORATION Advanced Space Structural Concepts		Anal 506-53
506-53-40 Planetary Geology	W83-70139	Paylo 506-53
151-01-70	W83-70292	Mult
Planetary Materials Analysis 152-01-40	W83-70293	506-55 Mult
Manned Lunar Base Study 153-06-40	W83-70302	506-55 Adva
VEGA Balloon Nephelometer Design 157-04-80	W83-70327	506-57 Larg
Space Systems and Navigation Technology		506-57
310-10-63 SPACE FLIGHT FEEDING	W83-70559	Spac 506-64
Food Requirements Production and Processis 199-60-42	ng for CELSS W83-70444	Platf 506-64
Waste Management for CELSS 199-60-52	W83-70445	Low 542-04
SPACE FLIGHT STRESS	770445	Long
Operational Laboratory Support 199-10-11	W83-70405	199-80 Life
Medical Operations Longitudinal Studies 199-10-21	W83-70407	199-80 Spac
Longitudinal Studies 199-10-22	W83-70408	906-50 Struc
Crew Health Maintenance		906-55
199-10-31 Crew Health Maintenance	W83-70409	Spac 906-64
199-10-32 Cardiovascular Deconditioning (JSC)	W83-70410	Geos 906-90
199-20-11 Cardiovascular Deconditioning	W83-70412	SPACE P Adva
199-20-12	W83-70413	506-55 SPACE P
Space Motion Sickness 199-20-21	W83-70414	Ther
Basic Mechanisms Underlying Space Motion S 199-20-22	ickness W83 70415	Evaluat 506-53
Bane Lass 199-20-31	W83-70416	Elect 506-55
Human Behavior and Performance		Plane Develo
199-20-82 Cosmos Flight Experiments Project	W83-70427	506-62
199-70-12 SPACE FLIGHT TRAINING	W83-70448	Giott 156-03
Human Behavior and Performance 199-20-82	W83-70427	X-Ra Planeta
SPACE LABORATORIES		157-03 VEG
Life Sciences Payload Accommodations	W83-70453	157-04 SPACE P
199-80-48		
	W83-70454	Cryst
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility		Cryst 542-03
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE	W83-70454 W83-70455	Cryst 542-03 Glass 179-11
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63		Cryst 542-03 Glass 179-11 Biop 179-13
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research	W83-70455	Cryst 542-03 Glass 179-11 Biopi 179-13 Mult 179-15
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING	W83-70455 W83-70161	Cryst 542-03 Glass 179-11 Biopp 179-13 Mult 179-15 Adva
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63	W83-70455 W83-70161 W83-70592 W83-70161	Crysi 542-03 Glass 179-11 Biopi 179-13 Mult 179-15 Adva 179-20
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telec	W83-70455 W83-70161 W83-70592 W83-70161 peration and	Cryst 542-03 Glass 179-11 Brop 179-13 Mult 179-15 Adva 179-20 Elect 179-20 Sphe
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telectory Robotics 506-54-65 Automation Research and Technology for Near-	W83-70161 W83-70592 W83-70161 peration and W83-70162	Cryst 542-03 Glass 179-11 Biop 179-13 Mult 179-12 Elect 179-2C Sphe 179-2C Extra
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telectories Robotics 506-54-65	W83-70161 W83-70592 W83-70161 peration and W83-70162	Cryst 542-03 Glass 179-11 Biop 179-12 Mult 179-12 Elect 179-2C Sphe 179-2C Extra 179-4 MPS
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telectobotics 506-54-65 Automation Research and Technology for Near-Operations 506-54-65 Space Station Operations	W83-70455 W83-70161 W83-70592 W83-70161 peration and W83-70162 Earth Mission W83-70163	Cryst 542-03 Glass 179-11 Biop 179-13 Multi 179-15 Adva 179-26 Elect 179-26 Sphe 179-26 Extra 179-40 MPS
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telectory Robotics 506-54-65 Automation Research and Technology for Near- Operations 506-64-27 SPACE MISSIONS	W83-70455 W83-70161 W83-70592 W83-70161 peration and W83-70162 Earth Mission W83-70163 W83-70237	Cryst 542-03 Glass 179-11 Biopi 179-13 Mill 179-15 Adva 179-20 Elect 179-20 Sphe 179-40 MPS 179-40 Rese 179-46 Rese 179-46
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Technology for Planning Telectory Robotics 506-54-65 Automation Research and Technology for Near-Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near-Operations	W83-70455 W83-70161 W83-70592 W83-70161 peration and W83-70162 Earth Mission W83-70163 W83-70237 Earth Mission	Cryst 542-03 Glass 179-11 Biopi 179-13 Multi 179-15 Adva 179-2C Elect 179-2C Sphe 179-2C Extra 179-4C MPS 179-4C Comm 179-4C Comm 179-4C Comm 179-6C C C C C C C C C C C C C C C C C C C
199-80-48 Large Primate Facility 199-80 52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telectopotics 506-54-65 Automation Research and Technology for Near-Operations 506-54-66 Space Station Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near-Operations 506-54-66	W83-70455 W83-70161 W83-70592 W83-70161 peration and W83-70162 Earth Mission W83-70163 W83-70237 Earth Mission W83-70163	Cryst 542-03 Glass 179-11 Biopin 179-13 Multi 179-15 Adva 179-2C Elect 179-2C Extra 179-4C MPS 179-4C TP3-4C C C C C C C C C C C C C C C C C C C
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telectory Robotics 506-54-65 Automation Research and Technology for Near- Operations 506-54-66 Space Station Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near- Operations 506-54-66 Technology Requirements for Advanced Space T Systems	W83-70455 W83-70161 W83-70592 W83-70161 peration and W83-70162 Earth Mission W83-70237 Earth Mission W83-70163 ransportation	Cryst 542-03 Glass 179-11 Biopin 179-13 Multi 179-15 Adva 179-2C Elect 179-2C Sphe 179-4C Rese 179-46 Comm 179-6C Cloud 179-75 Control
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Technology for Planning Telectory Robotics 506-54-65 Automation Research and Technology for Near-Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near-Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near-Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near-Operations 506-64-27 SPACE MISSIONS Space Station Operations 506-54-66 Space Station Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near-Operations 506-64-27 SPACE MISSIONS	W83-70455 W83-70161 W83-70592 W83-70162 Earth Mission W83-70163 W83-70237 Earth Mission W83-70163 W83-70163 W83-70163 W83-70163 W83-70163	Cryst 542-03 Glass 179-11 Biopi 179-13 Multi 179-15 Adva 179-2C Elect 179-2C Sphe 179-2C Extra 179-4C MPS 179-4C Community 179-75 Cont. 179-8C Biost Biography Biogr
199-80-48 Large Primate Facility 199-80-52 Mammalian Development Facility 199-80-62 SPACE MAINTENANCE Automation Systems Research 506-54-63 Orbital Services 906-75-00 SPACE MANUFACTURING Automation Systems Research 506-54-63 Automation Technology for Planning Telect Robotics 506-54-65 Automation Research and Technology for Near- Operations 506-54-66 Space Station Operations 506-64-27 SPACE MISSIONS Automation Research and Technology for Near- Operations 506-64-66 Technology Requirements for Advanced Space T Systems 506-63-23	W83-70455 W83-70161 W83-70592 W83-70162 Earth Mission W83-70163 W83-70237 Earth Mission W83-70163 W83-70163 W83-70163 W83-70163 W83-70163	Cryst 542-03 Glass 179-11 Biopin 179-13 Multi 179-15 Adva 179-20 Elect 179-20 Sphe 179-20 Elect 179-20 MPS 179-40 Rese 179-46 Comm 179-60 Cloud 179-75 Cont. 179-80

Attitude/Orbit Technology 310-10-26	
	W83-70555
Radio Metric Technology Development 310-10-60	W83-70557
Space Systems and Navigation Technology	
310-10-63 X-Band Uplink Development	W83-70559
310-20-64 SPACE OBSERVATIONS (FROM EARTH)	W83-70564
International Halley Watch 156-02-02	W83-70318
UV and Optical Astronomy 188-41-51	W83-70380
Detection of Other Planetary Systems 196-41-68	W83-70398
Asteroids 196-41-76	W83-70402
Planetary Infrared Imaging	
196-41-77 SPACE PLASMAS	W83-70403
Spacecraft Power Systems R & T 506-55-75	W83-70180
Solar Array Flight Experiment (SAFE) Dyna Augmentation (Flights 1 and 2)	amics & Control
506-62-49 Improvements in Neutral and Ion Mass Spe	W83-70215 ctrometry
157-04-80 Space Plasma Data Analysis	W83-70326
385-36-01 SPACE PLATFORMS	W83-70458
Advanced Space Structures 506-53-43	W83-70140
Analysis and Design	
506-53-53 Payloads Definition Methods	W83-70143
506-53-56 Multi-KW Solar Arrays	W83-70145
506-55-49 Multi-100 kW Low Cost Earth Orbital Syste	W83-70173 ems
506-55-79 Advanced Control Technology	W83-70183
506-57-15 Large Space Systems Technology Contro	W83-70186
506-57-19 Space Station Propulsion Requirements	W83-70188
506-64-12	W83-70229
Platform Systems Study 506-64-19	W83-70232
Low Duration Exposure Facility 542-04-13	W83-70247
Long Duration Life Sciences Satellite Pro 199-80-42	ogram Definition W83-70452
Life Sciences Payload Accommodations 199-80-48	W83-70453
Space Platform Specification Development 906-50-00	W83-70577
Structural Assembly Demonstration Exp 906-55-00	
Space Station Ground Operations Study I	follow on Study
906-64-22 Geostationary Platform Bus Definition	W83-70586
906-90-03 SPACE POWER REACTORS	W83-70595
Advanced Radiant Energy Conversion 506-55-13	W83-70166
SPACE PROBES Thermal Protection Systems Materials	
	and Systems
Evaluation 506-53-31	•
506-53-31 Electric Propulsion Technology	W83-70136
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research	W83-70136 W83-70168
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25	W83-70136 W83-70168 and Technology W83-70214
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-Planetary Exploration	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 Ray Methods for
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-Planetary Exploration 157-03-50	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 Ray Methods for
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 Ray Methods for W83-70324 W83-70327
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailoon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70327
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Oust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 Ray Methods for W83-70324 W83-70327 W83-70327
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 ay Methods for W83-70327 W83-70327 W83-70325 W83-70353
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 ay Methods for W83-70327 W83-70327 W83-70353 W83-70355
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DIDI 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol	W83-70136 W83-70214 SY) W83-70214 SY) W83-70324 W83-70327 W83-70324 W83-70356 W83-70356
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailoon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70325 W83-70355 W83-70356 W83-70356 W83-70356 W83-70356
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56	W83-70136 W83-70214 SY) W83-70214 SY) W83-70324 W83-70327 W83-70324 W83-70356 W83-70356
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DIDI 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70325 W83-70355 W83-70356 W83-70356 W83-70356 W83-70356
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 MPS AR&DA Support 179-40-62	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70326 W83-70355 W83-70356 Syy W83-70356 Syy W83-70357 W83-70357 W83-70357
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailoon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Sphenical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 MPS AR&DA Support 179-40-62 Research of the use of Space Resources 179-46-20	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70326 W83-70355 Syy W83-70356 Sology W83-70358 W83-70358 W83-70359 W83-70359 W83-70359 W83-70356 SOLOGY W83-70359 W83-70359 W83-70359 W83-70359
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailoon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-67 Extraterrestrial Materials Processing 179-40-62 Research of the use of Space Resources 179-46-20 Commercial Materials Processing in Low-Gr 179-66-62	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70326 W83-70355 Syy W83-70356 Sology W83-70358 W83-70358 W83-70359 W83-70359 W83-70359 W83-70356 SOLOGY W83-70359 W83-70359 W83-70359 W83-70359
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 MPS ARRDA Support 179-40-62 Research of the use of Space Resources 179-60-62 Commercial Materials Processing in Low-Gr 179-60-62 Commercial Materials Processing in Low-Gr	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70323 ay Methods for W83-70327 W83-70324 W83-70353 W83-70354 W83-70355 ology W83-70356 w83-70356 W83-70358 W83-70358 W83-70358 W83-70358
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DIDI 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 Research of the use of Space Resources 179-46-20 Commercial Materials Processing in Low-Gr 179-60-62 Cloud Physics 179-75-10 Containerless Processing	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70327 W83-70327 W83-70356 W83-70356 W83-70357 W83-70357 W83-70356 W83-70357 W83-70356 W83-70358 W83-70358 W83-70358 W83-70358 W83-70358 W83-70358
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Bailoon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 MPS AR&IDA Support 179-40-62 Research of the use of Space Resources 179-46-20 Commercial Materials Processing in Low-Gr 179-60-62 Cloud Physics 179-75-10 Containerless Processing	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70326 W83-70353 W83-70356 W83-70356 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70358 W83-70359 W83-70360 W83-70361
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DIO: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 MPS ARRDA Support 179-40-62 Research of the use of Space Resources 179-60-62 Commercial Materials Processing in Low-Gr 179-60-62 Commercial Materials Processing 179-80-60 Containerless Processing 179-80-30 Bioseparation Processes	W83-70136 W83-70168 and Technology W83-70214 SY) W83-70324 W83-70327 W83-70327 W83-70355 W83-70355 W83-70356 W83-70356 W83-70358 W83-70358 W83-70359 W83-70360 W83-70361 W83-70364 W83-70364
506-53-31 Electric Propulsion Technology 506-55-22 Planetary Aerocapture Systems Research Development 506-62-25 Giotto Dust Impact Detection System (DID: 156-03-07 X-Ray Gamma-Ray and Neutron/Gamma-I Planetary Exploration 157-03-50 VEGA Balloon Nephelometer Design 157-04-80 SPACE PROCESSING Crystal Growth in Space 542-03-30 Glass Research 179-11-20 Bioprocessing Studies 179-13-72 Multimode Acoustic Research 179-15-20 Advanced Containerless Processing Technol 179-20-55 Electrostatic Containerless Processing Technol 179-20-56 Spherical Shell Technology Study 179-20-57 Extraterrestrial Materials Processing 179-40-62 MPS AR&DA Support 179-40-62 Research of the use of Space Resources 179-60-62 Commercial Materials Processing in Low-Gr 179-60-62 Cloud Physics 179-75-10 Containerless Processing 179-80-30 Bioseparation Processes	W83-70136 W83-70168 and Technology W83-70214 Y83-70324 W83-70327 W83-70355 W83-70356 W83-70356 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70358 W83-70358 W83-70358 W83-70358 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70359 W83-70360 W83-70361

	Crystal Growth Processes 179-80-70	W83-7036
	Crystal Growth Research 179-80-70	W83-7036
SF	PACE RENDEZVOUS Large Space Systems Technology Control	
SE	506-57-19 PACE SHUTTLE MAIN ENGINE	W83-7018
-	Earth-to-Orbit Propulsion Life and Performance	
	506-60-12 Reusable High Pressure Main Engine Technolo 506-60-19	gy W83-7020
SF	ACE SHUTTLE ORBITERS	nd System
	Evaluation 506-53-31	W83-7013
	Thermal Protection Systems for Earth-To-Orbit 506-53-33	
	Advanced Carbon-Carbon Panels 506-53-37	W83-7013
	OEX (Orbiter Experiments) Project Support 506-63-31	W83-7021
	Shuttle Entry Air Data System (SEADS) 506-63-32	W83-7022
	Shuttle Infrared Leeside Temperature Sensing 506-63-34	(SILTS) W83-7022
	Infrared Imagery of Shuttle 506-63-35	W83-7022
	OEX Thermal Protection Experiments 506-63-36 Shuttle Upper Atmosphere Mass Spectron	W83-7022
	506-63-37 Dynamic Acoustic and Thermal Environme	W83-7022
	Experiment (Transportation Technology Veri Program)	ficationOE
	506-63-39 Space Shuttle Orbiter Flying Qualities Criteria	W83-7022 (OEX)
	506-63-40 OEX-Advanced Autopilot	W83-7022
	506-63-42 High Resolution Accelerometer Package (HiRA)	W83-7022 P) Experimen
	Development 506-63-43	W83-7022
	Multisensor Technique Development 677-21-28	W83-7051
	SMIRR Data Analysis 677-41 19 Use of SAR for Geologic Mapping	W83-7053
SF	677-43 16 PACE SHUTTLE PAYLOADS	W83-7053
	Space Vehicle Structural Dynamic Analysis a Methods	nd Synthesi
	506-53 59 Dynamic Acoustic and Thermal Environme	W83-7014 ents (DATE
	Experiment (Transportation Technology Veri Program)	
	506-63-39 Platform Systems Operations	W83-7022
	506-64 22 Development of a Shuttle Flight Experiment Di Module	W83-7023 rop Dynamic
	542-03-01 Shuttle Operational Flight Test of a Large Sola	W83-7024
	542-03-04 Space Calibration of Solar Cells	W83-7024
	542-03 20 Crystal Growth in Space	W83-7024
	542-03-30 Low Duration Exposure Facility	W83-7024
	542-04 13 Orbiting VLBI Feasibility Study	W83-7024
	159-41-03 Advanced X-Ray Astrophysics Facility (AXAF)	W83-7033
	159-46-01 Reduced Gravity Combustion Science	W83-7033
	179-80-51' Advanced Extravehicular Systems (Space Suit)	W83-7036
	199-60-21 Advanced Radar Concepts and Systems Study 677-29-18	W83-7052
		ecial Fligh
	906-64-23 Tethered Satellite System (TSS) (System (W83-7058 Development
	906-70-00 PACE SHUTTLES	W83-7059
	Simulation Facilities Operations 532-08-11	W83-7010
	Computational and Experimental Aerotherodyn. 506-51-11	amics W83-7012
	Space Vehicle Dynamics Methodology 506-53-55	W83-7014
	Programmable Mask Technology 506-54-17 Automations Technology for Manned Space Sy	W83-7015
	506-54-67 STS Control and Guidance Technology Develop	W83-70164
	506-57-17 Teleoperator Human Interface Technology	W83-7018
	506-57-25 Advanced Manned Vehicle Onboard Propulsion	W83-7019 Technology
	506-60-17 Technology Requirements for Advanced Space T	W83-7020
	Systems 506-63-23	W83-70216
	Automation of Space Transportation Systems 506-63-27	W83-7021
	Verification and Analysis of Satellite Derived P 146-71-00	roducts W83-7025
	Ocean Advanced Studies 161-10-00	W83-70332

Longitudinal Studies		Gamma Ray Astronomy and Related Resear		Communications Systems Technology Develo	
199-10-22 Advanced Equipment Development	W83-70408	188-46-57 Advanced Mission Study - Solar X-Ray Pinh	W83-70384 ole Satellite and	310-20-67 High-Speed Signal Processing Research	W83-70567
199-80-31 SIR-A Data Analysis	W83-70450	Long Focal Length Coronagraph 188-78-38	W83-70391	310-30-70 SPACECRAFT CONFIGURATIONS	W83-70570
677-43-18	W83-70541	SPACEBORNE EXPERIMENTS	VV63-70391	Entry Vehicle Aerothermodynamics	
SPACE STATIONS Advanced Space Structures		Computational and Experimental Aerotheroc	lynamics W83-70123	506-51-13 Conceptual Characterization and Technological Characterization and Technological Characterization and Conceptual Characterization and Char	W83-70124 agy Assessment
506-53-43	W83-70140	506-51-11 Multidisciplinary Research	W03-70123	506-63-29	W83-70218
Analysis and Design 506-53-53	W83-70143	506-56-20	W83-70184	SPACECRAFT CONSTRUCTION MATERIALS Composites for Advanced Space Systems	
Payloads Definition Methods 506-53-56	W83-70145	OEX (Orbiter Experiments) Project Support 506-63-31	W83-70219	506-53-23 Effects of Space Environment on Composites	W83-70131
Solid State & Optical Device Research		Platform Systems Operations		506-53-25	W83-70132
506-54-13 Programmable Mask Technology	W83-70149	506-64-22 Development of a Shuttle Flight Experiment	W83-70233	Electrically Conductive Thermal Control Coat 506-53-26	ngs W83-70133
506-54-17	W83-70152	Module		Hypervelocity Impact Resistance of Comp	osite Materials
Automations Technology for Manned Space 506-54-67	Systems W83-70164	542-03-01 Tribological Experiments in Zero Gravity	W83-70241	506-53-27 Space Durable Composites and Thermal C	W83-70134 Control Surfaces
Thermal Management for On-Orbit Energy \$ 506-55-77	Systems	542-03-27	W83-70245	506-53-29	W83-70135
Advanced Control Technology	W83-70182	Crystal Growth in Space 542-03-30	W83-70246	Thermal Protection Systems Materials Evaluation	and Systems
506-57-15 Large Space Systems Technology Contro	W83-70186	Low Duration Exposure Facility		506-53-31 Thermal Protection Systems for Earth-To-Ort	W83-70136
506-57-19	W83-70188	542-04-13 Studies of Dynamics of Atmospheric Flows	W83-70247	506-53-33	W83-70137
Future Data Systems Concepts 506-58-11	W83-70195	146-76-00 Orbiting VLBI Feasibility Study	W83-70264	Advanced Carbon-Carbon Panels 506-53-37	W83-70138
Space Station Communication Technology		159-41-03	W83-70330	SPACECRAFT CONTAMINATION	
506-58-27 Advanced Low Thrust Chemical Propul:	W83-70204	Bioprocessing Studies 179-13-72	W83-70354	Advanced Low Thrust Chemical Propuls 506-60-25	w83-70209
506-60-25	W83-70209	Reduced Gravity Combustion Science		Spacecraft System Technology	
Technology Systems Analysis Across Permanently Orbiting Space Stations	Disciplines for	179-80-51 Gravitational Wave Astronomy and Cosmolo	W83-70366	506-64-15 SPACECRAFT CONTROL	W83-70231
506-64-13	W83-70230	188-41-22	W83-70378	Spacecraft Controls and Guidance	W02 7018E
Platform Systems Study 506-64-19	W83-70232	Advanced Technological Development Gene Data Processing Electronics Solid State Detec		506-57-13 Advanced Control Technology	W83-70185
Space Station Life Support Technology 506-64-31	W00 70220	188-78-51	W83-70393	506-57-15	W83-70186
Climate Observations	W83-70239	Developmental Biology 199-40-22	W83-70432	STS Control and Guidance Technology Devel 506-57-17	W83-70187
672-40-00 Space Station Resource Observations Paylor	W83-70494	Cosmos Flight Experiments Project		Large Space Systems Technology Control 506-57-19	and Guidance W83-70188
677-29-14	W83-70524	199-70-12 Sample Bank	W83-70448	Advanced Large Spacecraft Systems Analysis	s
Space Platform Specification Development 906-50-00	W83-70577	199-70-32	W83-70449	506-62-23 Planetary Aerocapture Systems Research a	W83-70213
Space Operations Study Follow on		Advanced Equipment Development 199-80-31	W83-70450	Development	
906-64-20 SPACE SUITS	W83-70584	Long Duration Life Sciences Satellite Pro	gram Definition W83-70452	506-62-25 Solar Array Flight Experiment (SAFE) Dynar	W83-70214
Longitudinal Studies		199-80-42 Life Sciences Payload Accommodations	W03-70452	Augmentation (Flights 1 and 2)	
199-10-22 Advanced Extravehicular Systems (Space St	W83-70408	199-80-48 Large Primate Facility	W83-70453	506-62-49 Space Station Operations	W83-70215
199-60-21	W83-70442	199-80-52	W83-70454	506-64-27	W83-70237
Advanced Extravehicular Systems 199-60-22	W83-70443	Mammalian Development Facility 199-80-62	W83-70455	Attitude/Orbit Technology 310-10-26	W83-70555
SPACE TOOLS		High Energy Astrophysics Data Analysis		SPACECRAFT DESIGN	
Teleoperator and EVA Human Factors 506-57-29	W83-70193	385-46-01 Shuttle Time and Frequency Transfer Exp	W83-70464 errment (STIFT)	Detailed Aerothermal Loads 506-51-23	W83-70125
				Analysis and Design	
SPACE TRANSPORTATION SYSTEM		676-59-41	W83-70512		70440
Detailed Aerothermal Loads 506-51-23	W83-70125	SPACEBORNE TELESCOPES	W83-70512	506-53-53 Advanced Large Spacecraft Systems Analysis	W83-70143
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures		SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21	W83-70153	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23	w83-70213
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design	W83-70125 W83-70140	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard	W83-70153	506-53-53 Advanced Large Spacecraft Systems Analysis	w83-70213 Transportation
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53		SPACEBORNE TELESCOPES Far Intrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy	W83-70153 ware W83-70372	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23	w83-70213
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15	W83-70140 W83-70143 W83-70186	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51	W83-70153 ware	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31	w83-70213 Transportation
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve	W83-70140 W83-70143 W83-70186	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of Machine Space Systems Systems	W83-70153 ware W83-70372 W83-70400 IASA Networks	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology	W83-70213 Transportation W83-70216 W83-70219
Detailed Aerothermal Loads 508-51-23 Advanced Space Structures 508-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 508-57-17 Large Space Systems Technology Control	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of N 310-20-46 SPACECRAFT CABIN ATMOSPHERES	W83-70153 ware W83-70372 W83-70400	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study	W83-70213 Transportation W83-70216 W83-70219 W83-70231
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of N 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19	W83-70213 Transportation W83-70216 W83-70219
Detailed Aerothermal Loads 508-51-23 Advanced Space Structures 508-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 508-57-19 Technology Requirements for Advanced Space Systems	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188 e Transportation	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of N 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space	W83-70140 W83-70143 W83-70186 Proprient W83-70187 I and Guidance W83-70188 Transportation W83-70216	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27	W83-70140 W83-70143 W83-70186 Plopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technologo	W83-70140 W83-70143 W83-70186 Plopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of N 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-63-29 OEX (Orbiter Experiments) Project Support	W83-70140 W83-70186 Hopment W83-70187 I and Guidance W83-70188 e Transportation W83-70216 IS W83-70217 Day Assessment W83-70218	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Control 506-57-17 Large Space Systems Technology Control 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-3-31 Low Duration Exposure Facility	W83-70140 W83-70186 elopment W83-70187 I and Guidance W83-70188 a Transportation W83-70216 IS W83-70217 Ogy Assessment W83-70218 W83-70218	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of A 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-17 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-23 Conceptual Characterization and Technolo 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13	W83-70140 W83-70186 Hopment W83-70187 I and Guidance W83-70188 e Transportation W83-70216 IS W83-70217 Day Assessment W83-70218	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of N 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-38-01 SPACECRAFT COMMUNICATION	W83-70153 ware W83-70372 W83-70400 JASA Networks W83-70563 W83-70411 W83-70440 W83-70440 W83-70441 W83-70180 W83-70458	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-21 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technol 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00	W83-70140 W83-70186 elopment W83-70187 I and Guidance W83-70188 a Transportation W83-70216 IS W83-70217 Ogy Assessment W83-70218 W83-70218	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22	W83-70153 ware W83-70372 W83-70400 JASA Networks W83-70563 W83-70411 W83-70440 W83-70440 W83-70441 W83-70180 W83-70458	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect	w83-70213 Transportation w83-70216 w83-70219 w83-70231 w83-70232 and Guidance w83-70188 w83-70237 w83-70592 rat Signal and ors w83-70393
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage	W83-70140 W83-70186 Blopment W83-70187 and Guidance W83-70188 e Transportation W83-70216 U83-70217 U83-70217 U83-70218 W83-70219 W83-70247 W83-70247	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 analogy W83-70200	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 PACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70393
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-17 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-23 Automation of Space Transportation System 506-63-21 Conceptual Characterization and Technolog 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation	W83-70140 W83-70186 slopment W83-70187 I and Guidance W83-70188 8 Transportation W83-70216 IS W83-70217 Ogy Assessment W83-70218 W83-70219 W83-70247 W83-70578	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support	W83-70153 ware W83-70372 W83-70400 W83-70400 W83-70411 W83-70440 W83-70441 W83-70180 W83-70458 w83-70458 w83-70466	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene 504-57-505 Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70393
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technology 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00	W83-70140 W83-70186 Blopment W83-70187 and Guidance W83-70188 e Transportation W83-70216 U83-70217 U83-70217 U83-70218 W83-70219 W83-70247 W83-70247	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 analogy W83-70200	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Development	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70393 nents (DATE) ents (DATE) w83-70225
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27 Conceptual Characterization and Technology 606-63-27 OEX (Orbiter Experiments) Project Support 506-63-21 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 I Transportation W83-70216 W83-70217 Pay Assessment W83-70218 W83-70247 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitablity Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 550-60-00	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 analogy W83-70200 W83-70466 W83-70472 W83-70473	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-7018 W83-70237 W83-70592 rat Signal and ors W83-70393 ments (DATE)
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-21 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-21 Orbital Transfer Vehicle Ground Operations	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216 W83-70217 Ogy Assessment W83-70218 W83-70219 W83-70247 W83-70578 W83-70583 tems Ground W83-70585	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 analogy W83-70200 W83-70466 W83-70472 W83-70473	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developmes 506-64-37 Operational Laboratory Support 199-10-11	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70393 nents (DATE) ents (DATE) w83-70225
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Contro 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-53-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24	W83-70140 W83-70143 W83-70186 Plopment W83-70187 I and Guidance W83-70216 ISS W83-70217 TORY ASSESSMENT W83-70219 W83-70219 W83-70247 W83-70578 W83-70583 tems Ground W83-70585 Study W83-70588	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-00 Space Communications Systems Antenna Te 650-60-02 Satellite Switching and Processing Systems	W83-70153 ware W83-70400 W83-70400 W83-70563 W83-70411 W83-70441 W83-70441 W83-70458 w83-70458 w83-70474 W83-70474 W83-70474	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-7018 W83-70237 W83-70592 rat Signal and ors W83-70393 ments (DATE) prificationOEX W83-70225 int W83-70240 W83-70240
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Contro 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-53-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24	W83-70140 W83-70186 Blopment W83-70187 In and Guidance W83-70188 In Transportation W83-70216 W83-70216 W83-70217 U83-70218 W83-70219 W83-70219 W83-70578 W83-70583 W83-70582 W83-70583 W83-70583 W83-70585 Study	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 335-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 analogy W83-70472 W83-70472 W83-70474 W83-70475	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70237 W83-70592 rat Signal and ors W83-70393 ments (DATE) milicationOEX W83-70225 int W83-70240
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-63-27 Conceptual Characterization and Technolo 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 5 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188 a Transportation W83-70216 ISS W83-70217 DBY Assessment W83-70219 W83-70219 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70588 Vehicles (SDV) W83-70589	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication	W83-70153 ware W83-70400 W83-70400 W83-70563 W83-70411 W83-70441 W83-70441 W83-70458 w83-70458 w83-70472 w83-70472 w83-70474 W83-70475 ssystems W83-70476	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-21 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Verogram) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70393 hents (DATE) rificationOEX W83-70240 W83-70240 W83-70440
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27 Conceptual Characterization and Technology 608-63-27 Conceptual Characterization and Technology 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-21 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24 Advanced Transportation Shuttle Derived 906-65-00	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188 e Transportation W83-70216 W83-70217 Ogy Assessment W83-70218 W83-70219 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70588 V83-70588	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde	W83-70153 ware W83-70400 W83-70400 W83-70563 W83-70411 W83-70441 W83-70441 W83-70458 W83-70458 W83-70472 W83-70472 W83-70474 W83-70475 Systems W83-70476 r Development	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70188 W83-70592 ral Signal and ors W83-70393 ments (DATE) rificationOEX W83-70225 rint W83-70240 W83-70405 W83-70440 W83-70440
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27 Conceptual Characterization and Technolo 508-63-27 Conceptual Characterization and Technolo 508-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 1 906-64-24 Advanced Transportation Shuttle Derived 906-75-00 Deployable Antenna Flight Experiment	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216 W83-70217 Ogy Assessment W83-70219 W83-70219 W83-70582 W83-70582 W83-70583 tems Ground W83-70588 Vehicles (SDV) W83-70589 W83-70589 W83-70591	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiment Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 mnology W83-70472 W83-70472 W83-70472 W83-70476 s Systems W83-70476 r Development W83-70477	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-23 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-15	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70237 W83-70592 rat Signal and ors W83-70393 ments (DATE) milicationOEX W83-70240 W83-70405 W83-70440 W83-70440 W83-70185
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-63-27 OEX (Orbiter Experiments) Project Support 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-75-00 Deployable Antenna Flight Experiment	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 I Transportation W83-70216 IS W83-70217 BW83-70217 W83-70218 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70585 Study W83-70589 W83-70589 W83-70589	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of A 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies	W83-70153 ware W83-70400 W83-70400 W83-70463 W83-70411 W83-70441 W83-70441 W83-70458 mnology W83-70472 W83-70472 W83-70475 schnology W83-70476 r Development W83-70477 telline (ACTS)	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70237 W83-70592 rat Signal and ors W83-70393 ments (DATE) milicationOEX W83-70240 W83-70405 W83-70440 W83-70440 W83-70185
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-53-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys 006-64-21 Orbital Transfer Vehicle Ground Operations : 906-64-21 Orbital Transfer Vehicle Ground Operations : 906-64-21 Orbital Transfer Vehicle Ground Speriment 906-65-00 Teleoperator Maneuvering System 906-75-00 Deployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environi	W83-70140 W83-70143 W83-70186 Proposed to W83-70187 I and Guidance W83-70188 I Transportation W83-70216 W83-70217 W83-70217 W83-70219 W83-70219 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70588 Vehicles (SDV) W83-70589 W83-70591 W83-70594 SS ments (DATE)	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiment Program Support 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 550-60-23 Advanced Communications Technology Sa System Studies	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 mnology W83-70472 W83-70472 W83-70472 W83-70476 s Systems W83-70476 r Development W83-70477	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-21 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-63-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology Develop6-57-15 STS Control and Guidance Technology Develop6-57-15 STS Control and Guidance Technology Develop6-57-17 Large Space Systems Technology Control	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rail Signal and ors W83-70393 rents (DATE) rifficationOEX W83-70240 W83-70405 W83-70440 W83-70440 W83-70185 opment W83-70185 opment W83-70187 and Guidance
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 High Energy Upper Stage 906-53-00 Advanced Transportation 906-63-20 Advanced Space Transportation System 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-75-00 Opeloyable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT	W83-70140 W83-70143 W83-70186 Proposed to W83-70187 I and Guidance W83-70188 I Transportation W83-70216 W83-70217 W83-70217 W83-70219 W83-70219 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70588 Vehicles (SDV) W83-70589 W83-70591 W83-70594 SS ments (DATE)	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-020 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Advanced Communications Technology Sa System Studies 650-60-23 Advanced Communications Technology Sa System Studies 50-60-26 Software Technology 310-10-23	W83-70153 ware W83-70400 W83-70400 W83-70463 W83-70411 W83-70441 W83-70441 W83-70458 mnology W83-70472 W83-70472 W83-70475 schnology W83-70476 r Development W83-70477 telline (ACTS)	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environic Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Develop- 506-57-17 Large Space Systems Technology Control 506-57-19	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 ral Signal and ors W83-70393 ments (DATE) rifficationOEX W83-70225 rat W83-70240 W83-70440 W83-70440 W83-70186 opment W83-70186
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27 Conceptual Characterization and Technology 608-63-27 Conceptual Characterization and Technology 608-63-29 OEX (Orbiter Experiments) Project Support 506-63-21 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-54-00 High Energy Upper Stage 906-63-00 Advanced Transportation 906-63-20 Advanced Space Transportation Sys 0perations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-65-00 Teleoperator Maneuvering System 906-55-00 Deployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environi Experiment (Transportation Technology Vi Program) 506-63-39 Space Shuttle Orbiter Flying Qualities Criter	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216 IS W83-70216 IS W83-70217 PSY Assessment W83-70247 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70589	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies 650-60-26 Software Technology 310-10-23 Network Systems Technology Development	W83-70153 ware W83-70400 W83-70400 W83-70401 W83-70411 W83-70441 W83-70441 W83-70458 W83-70458 W83-70472 W83-70472 W83-70474 W83-70476 r Development W83-70477 tellite (A CTS)	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developmes 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Develop 506-57-19 SPACECRAFT INSTRUMENTS Shuttle Entry Air Data System (SEADS)	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70393 rents (DATE) rifficationOEX W83-70240 W83-70240 W83-70405 W83-70405 W83-70186 opment W83-70186 opment W83-70187 and Guidance W83-70188
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 High Energy Upper Stage 906-53-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-75-00 Deployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environi Experiment (Transportation Technology Viriogram) 506-63-39 Space Shuttle Orbiter Flying Qualities Criteri 506-63-40	W83-70140 W83-70143 W83-70186 elopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216 ISS W83-70217 OBY Assessment W83-70219 W83-70219 W83-70247 W83-70582 W83-70582 W83-70583 tems Ground W83-70588 Vehicles (SDV) W83-70589 W83-70589 W83-70591 W83-70594 ISS Ements (DATE) ErrificationOEX W83-70225	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiment Program Support 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies 650-60-26 Software Technology 310-10-23 Network Systems Technology Development 310-20-33 Advanced Space Systems for Users of N	W83-70153 ware W83-70400 IASA Networks W83-70563 W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 M83-70458 M83-70472 W83-70472 W83-70473 Systems W83-70474 W83-70476 To Development W83-70477 telline (ACTS) W83-70478 W83-70478 W83-70478 W83-70478 W83-70478 W83-70478 W83-70478	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-17 Large Space Systems Technology Control 506-57-17 Large Space Systems Technology Control 506-57-19 SPACECRAFT INSTRUMENTS Shuttle Entry Air Data System (SEADS) 506-63-32	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 ral Signal and ors W83-70393 ments (DATE) inficationOEX W83-70225 int W83-70240 W83-70440 W83-70465 W83-70186 opment W83-70187 and Guidance W83-70188
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolo 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 Atly Energy Upper Stage 906-53-00 Advanced Transportation 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-75-00 Oeployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environ: Experiment (Transportation Technology Virgogram) 506-63-39 Space Shuttle Orbiter Flying Qualities Criteri 506-63-40 SPACEBORNE ASTRONOMY Ground-Based Observations of the Sun	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 I Transportation W83-70216 ISS W83-70217 PSY Assessment W83-70247 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70585 Study W83-70585 Study W83-70589 W83-70589 W83-70589 W83-70589 W83-70594 Sments (DATE) ertification-OEX W83-70225 I (OEX) W83-70225	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tect 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies 650-60-26 Software Technology 310-10-23 Network Systems Technology Development 310-20-33	W83-70153 ware W83-70400 W83-70400 W83-70463 W83-70411 W83-70441 W83-70441 W83-70458 mology W83-70472 W83-70472 W83-70474 W83-70475 s Systems W83-70476 r Development W83-70477 telline (ACTS) W83-70478 W83-70478 W83-70478	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Verogram) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-13 Large Space Systems Technology Control 506-57-17 Large Space Systems Technology Control 506-57-17 SPACECRAFT INSTRUMENTS Shuttle Entry Air Data System (SEADS) 506-63-32 High Resolution Accelerometer Package (HiRA) Development	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70593 rat Signal and ors W83-70186 opment W83-70186 opment W83-70187 and Guidance W83-70188 W83-70220 AP) Experiment
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 Advanced Transportation 906-63-00 Advanced Space Transportation System 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-21 Orbital Transfer Vehicle Ground Operations 906-64-24 Advanced Transportation Shuttle Derived 906-55-00 Teleoperator Maneuvering System 906-75-00 Deployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environ Experiment (Transportation Technology Virogram) 506-63-40 SPACEBORNE ASTRONOMY Ground-Based Observations of the Sun 188-33-52	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 B Transportation W83-70216 IS W83-70216 IS W83-70217 PSY Assessment W83-70247 W83-70247 W83-70578 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70589	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies 650-60-23 Network Systems Technology Development 310-20-33 Advanced Space Systems for Users of N 310-20-46 X-Band Uplink Development 310-20-64	W83-70153 ware W83-70400 IASA Networks W83-70563 W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 M83-70458 M83-70472 W83-70472 W83-70473 Systems W83-70474 W83-70476 To Development W83-70477 telline (ACTS) W83-70478 W83-70478 W83-70478 W83-70478 W83-70478 W83-70478 W83-70478	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Developme 506-57-17 Large Space Systems Technology Control 506-57-19 SPACECRAFT INSTRUMENTS Shuttle Entry Air Data System (SEADS) 506-63-32 High Resolution Accelerometer Package (HiRA Development 506-63-43	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 ral Signal and ors W83-70393 ments (DATE) inficationOEX W83-70225 int W83-70240 W83-70440 W83-70465 W83-70186 opment W83-70187 and Guidance W83-70188
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27 Conceptual Characterization and Technolog 506-63-27 OEX (Orbiter Experiments) Project Support 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-63-00 Advanced Transportation 906-63-00 Advanced Transportation 906-63-00 Teleoperator Maneuvering System 906-64-21 Orbital Transfer Vehicle Ground Operations: 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-75-00 Oeployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environic Experiment (Transportation Technology Virgogram) 506-63-39 Space Shuttle Orbiter Flying Qualities Criteric 506-63-40 SPACEBORNE ASTRONOMY Ground-Based Observations of the Sun 188-38-52 Ultraviolet Detector Development 188-41-24	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 I Transportation W83-70216 W83-70217 Pay Assessment W83-70247 W83-70247 W83-70578 W83-70582 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70585 Study W83-70589 W83-70589 W83-70589 W83-70589 W83-70589 W83-70591 W83-70594 S ments (DATE) errification-OEX W83-70225 a (OEX) W83-70226 W83-70374 W83-70379	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies 650-60-25 Software Technology 310-10-23 Network Systems Technology Development 310-20-34 A-Band Uplink Development 310-20-64 Artenna Systems Development 310-20-65	W83-70153 ware W83-70372 W83-70400 IASA Networks W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 mology W83-70200 W83-70472 W83-70472 W83-70475 s Systems W83-70476 T Development W83-70477 tellite (A CTS) W83-70478 W83-70478 W83-70478 W83-70478 W83-70478 W83-70478 W83-70554	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Verogram) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-13 Large Space Systems Technology Control 506-57-17 Large Space Systems Technology Control 506-57-17 SPACECRAFT INSTRUMENTS Shuttle Entry Air Data System (SEADS) 506-63-32 High Resolution Accelerometer Package (HiRA Development 506-63-43 Giotto Halley Modeling 156-03-01	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70592 rat Signal and ors W83-70393 rents (DATE) rificationOEX W83-70225 rat W83-70240 W83-70440 W83-70405 W83-70405 W83-70186 opment W83-70186 opment W83-70188 W83-70188 W83-70188 W83-70189 W83-70189
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation System 506-63-27 Conceptual Characterization and Technolog 506-63-27 Conceptual Characterization and Technolog 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-53-00 Advanced Transportation 906-63-00 Advanced Space Transportation Sys Operations 906-64-21 Orbital Transfer Vehicle Ground Operations: 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-65-00 Space Shuttle Orbiter Flying Qualities Criteris 506-63-39 Space Shuttle Orbiter Flying Qualities Criteris 506-63-40 SPACEBORNE ASTRONOMY Ground-Based Observations of the Sun 188-38-52 Ultraviolet Detector Development 188-41-24 Particle Astrophysics and Experiment De	W83-70140 W83-70143 W83-70186 Proposed to the	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of A 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 646-41-02 Mobile Satellite Experiment 650-60-020 Space Communications Systems Antenna Te 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Nutching and Processing Systems 650-60-22 Communications Laboratory for Transponde and Satellite Nutching Technology 310-10-23 Advanced Communications Technology Sa System Studies 650-60-28 Software Technology 310-10-23 Network Systems Technology Development 310-20-34 Antenna Systems Development 310-20-64 Antenna Systems Development	W83-70153 Ware W83-70400 W83-70400 W83-70400 W83-70563 W83-70411 W83-70441 W83-70441 W83-70458 W83-70458 W83-70472 W83-70472 W83-70475 Systems W83-70476 r Development W83-70478 W83-70478 W83-70478 W83-70478 W83-70564 W83-70564 W83-70564 W83-70565	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environm Experiment (Transportation Technology Ve Program) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Control and Guidance 506-57-13 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Developme 506-63-32 High Resolution Accelerometer Package (HiRA Development 506-63-43 Giotto Halley Modeling 156-03-01 Giotto Dust Impact Detection System (DIDS)	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 ral Signal and ors W83-70393 thents (DATE) trificationOEX W83-70225 that W83-70240 W83-70440 W83-70440 W83-70186 topment W83-70186 topment W83-70186 topment W83-70188 W83-70188 W83-70188 W83-70189 W83-70220 AP) Experiment W83-70228 W83-70228
Detailed Aerothermal Loads 506-51-23 Advanced Space Structures 506-53-43 Analysis and Design 506-53-53 Advanced Control Technology 506-57-15 STS Control and Guidance Technology Deve 506-57-17 Large Space Systems Technology Contro 506-57-19 Technology Requirements for Advanced Space Systems 506-63-23 Automation of Space Transportation Systems 506-63-27 Conceptual Characterization and Technolog 506-63-27 OEX (Orbiter Experiments) Project Support 506-63-29 OEX (Orbiter Experiments) Project Support 506-63-31 Low Duration Exposure Facility 542-04-13 Manned Facilities 906-63-00 Advanced Transportation 906-63-00 Advanced Transportation 906-63-00 Teleoperator Maneuvering System 906-64-21 Orbital Transfer Vehicle Ground Operations: 906-64-24 Advanced Transportation Shuttle Derived 906-65-00 Teleoperator Maneuvering System 906-75-00 Oeployable Antenna Flight Experiment 906-90-00 SPACE TRANSPORTATION SYSTEM FLIGHT Dynamic Acoustic and Thermal Environic Experiment (Transportation Technology Virgogram) 506-63-39 Space Shuttle Orbiter Flying Qualities Criteric 506-63-40 SPACEBORNE ASTRONOMY Ground-Based Observations of the Sun 188-38-52 Ultraviolet Detector Development 188-41-24	W83-70140 W83-70186 Blopment W83-70187 I and Guidance W83-70188 I Transportation W83-70216 W83-70217 Pay Assessment W83-70247 W83-70247 W83-70578 W83-70582 W83-70582 W83-70583 tems Ground W83-70585 Study W83-70585 Study W83-70589 W83-70589 W83-70589 W83-70589 W83-70589 W83-70591 W83-70594 S ments (DATE) errification-OEX W83-70225 a (OEX) W83-70226 W83-70374 W83-70379	SPACEBORNE TELESCOPES Far Infrared Detectors and Cooled Research 506-54-21 Development of Solar Experiments and Hard 188-38-51 Radio Astronomy 196-41-73 SPACECRAFT ANTENNAS Advanced Space Systems for Users of M 310-20-46 SPACECRAFT CABIN ATMOSPHERES Systems Habitability Verification 199-10-41 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 SPACECRAFT CHARGING Spacecraft Power Systems R & T 506-55-75 Space Plasma Data Analysis 385-36-01 SPACECRAFT COMMUNICATION Satellite Communications Research and Tecl 506-58-22 Technical Consultation Services 643-10-01 Applications Experiments Program Support 650-60-00 Space Communications Systems Antenna Te 650-60-20 Satellite Switching and Processing Systems 650-60-21 RF Components for Satellite Communication 650-60-22 Communications Laboratory for Transponde and Satellite Network Evaluation 650-60-23 Advanced Communications Technology Sa System Studies 650-60-25 Software Technology 310-10-23 Network Systems Technology Development 310-20-34 A-Band Uplink Development 310-20-64 Artenna Systems Development 310-20-65	W83-70153 Ware W83-70372 W83-70400 W83-70400 W83-70563 W83-70411 W83-70440 W83-70441 W83-70458 M83-70458 M83-70472 W83-70472 W83-70474 W83-70475 s Systems W83-70476 r Development W83-70477 tellite (A CTS) W83-70478 W83-70478 W83-70564 W83-70564	506-53-53 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 OEX (Orbiter Experiments) Project Support 506-63-31 Spacecraft System Technology 506-64-15 Platform Systems Study 506-64-19 SPACECRAFT DOCKING Large Space Systems Technology Control 506-57-19 Space Station Operations 506-64-27 Orbital Services 906-75-00 SPACECRAFT ELECTRONIC EQUIPMENT Advanced Technological Development Gene Data Processing Electronics Solid State Detect 188-78-51 SPACECRAFT ENVIRONMENTS Dynamic Acoustic and Thermal Environin Experiment (Transportation Technology Verogram) 506-63-39 Life Support Systems Technology Developme 506-64-37 Operational Laboratory Support 199-10-11 Advanced Life Support Systems 199-60-11 SPACECRAFT GUIDANCE Spacecraft Controls and Guidance 506-57-13 Advanced Control Technology 506-57-13 Large Space Systems Technology Control 506-57-17 Large Space Systems Technology Control 506-57-17 SPACECRAFT INSTRUMENTS Shuttle Entry Air Data System (SEADS) 506-63-32 High Resolution Accelerometer Package (HiRA Development 506-63-43 Giotto Halley Modeling 156-03-01	W83-70213 Transportation W83-70216 W83-70219 W83-70231 W83-70232 and Guidance W83-70188 W83-70237 W83-70592 rat Signal and ors W83-70592 rat Signal and ors W83-70393 rents (DATE) rificationOEX W83-70225 rat W83-70240 W83-70440 W83-70405 W83-70405 W83-70186 opment W83-70186 opment W83-70188 W83-70188 W83-70188 W83-70189 W83-70189

X-Ray Gamma-Ray and Neutron/Gamma-Ray Methods for Planetary Exploration	Space Vehicle Structural Dynamic Analysis and Synthesis Methods	JSC General Operations Support - Planetary Materials 152-05-40 W83 70297
157-03-50 W83-70324	506-53-59 W83-70146	Sample Bank
Infrared Experiment Development 157-04-80 W83-70325	Photovoltaic Research and Technology 506-55-42 W83-70170	199-70-32 W83-70449
157-04-80 W83-70325 Improvements in Neutral and Ion Mass Spectrometry	High Performance Solar Array Research and Technology	SPECTRAL BANDS Atomic and Molecular Properties of Planetary Atmospheric
157-04-80 W83-70326	506-55-45 W83-70172	Constituents
Planetary Instrument Development Program/Planetary Astronomy	Spacecraft Power Systems R & T 506-55-75 W83-70180	154-50-80 W83-70313
157-05-50 W83-70328	Space Station Operations	SPECTRAL LINE WIDTH Laser Laboratory Spectroscopy
Planetary Instrument Definition 157-20-70 W83-70329	506-64-27 W83-70237 SPACECRAFT TELEVISION	147-23-09 W83-70282
157-20-70 W83-70329 Soil/Snow Moisture Research and Assessment Mission	Teleoperations and Cryogenic Fluid Management	Millimeter/Submillimeter Laboratory Spectroscopy
Study	506-64-29 W83-70238	147-23-10 W83 70283 SPECTRAL RECONNAISSANCE
677-29-05 W83-70521 SPACECRAFT MANEUVERS	SPACECRAFT TRACKING Software Technology	High Spectral Resolution Techniques for Geologic Mapping
Large Space Systems Technology Control and Guidance	310-10-23 W83-70554	677-41-14 W83-70531
506-57-19 W83-70188	Precision Time and Frequency Sources 310-10-42 W83-70556	Topographic Mapping Methods 677-43-17 W83-70540
Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 W83-70226	Radio Metric Technology Development	SPECTRAL REFLECTANCE
Space Station Operations	310-10-60 W83-70557	Asteroids
506-64-27 W83-70237 SPACECRAFT POWER SUPPLIES	Space Systems and Navigation Technology 310-10-63 W83-70559	196-41-76 W83-70402
Advanced Concepts in Energy Conversion	Very Long Baseline Interferometry (VLBI) Tracking of the	Improved Rock Type Discrimination 677-41-03 W83-70529
506-55-12 W83-70165	Tracking and Data Relay Satellite (TDRS) 310-20-39 W83-70562	SPECTRAL RESOLUTION
Technology of Advanced Concepts 506-55-15 W83-70167	Operations Support Computing Technology	Acousto-Optic & Submillimeter Device Technology 506-54-16 W83-70151
Photovoltaic Research and Technology	310-40-26 W83-70571	Global Weather Research - Advanced Moisture and
506-55-42 W83-70170 Solar Cell Research	Systems Management Technology 310-40-49 W83-70575	Temperature Sounder (AMTS)
506-55-43 W83-70171	SPACECREWS	146-72-02 W83-70259
High Performance Solar Array Research and Technology	Space Human Factors 506-57-21 W83-70189	Infrared Laboratory Spectroscopy in Support of Stratospheric Measurements
506-55-45 W83-70172 Multi-KW Solar Arrays	Human Factors for Crew Interfaces in Space	147-23-08 W83-70281
506-55-49 W83-70173	506-57-27 W83-70192	Atomic and Molecular Properties of Planetary Atmospheric
Electrochemical Energy Conversion and Storage 506-55-52 W83-70174	Teleoperator and EVA Human Factors 506-57-29 W83-70193	Constituents 154-50-80 W83-70313
Advanced Electrochemical Systems	Inflight Medical Support	X-Ray Astronomy
506-55-55 W83-70175	199-10-00 W83-70404 Operational Laboratory Support	188-46-59 W83-70387
Orbital Energy Storage and Power Systems 506-55-57 W83-70176	199-10-11 W83-70405	Ground-Based Infrared Astronomy 196-41-50 W83-70394
Thermal to Electric Energy Conversion Technology	Longitudinal Studies	Intercomparison of Dobson and Interferometric
506-55-65 W83-70177	199-10-22 W83-70408 Crew Health Maintenance	Spectrometer 673-13-00 W83 70499
Space Energy Conversion Support 506-55-70 W83-70178	199-10-31 W83-70409	673-13-00 W83 70499 Space Station Resource Observations Payload Study
Power Systems Management and Distribution	Crew Health Maintenance	677-29-14 W83-70524
506-55-72 W83-70179 Spacecraft Power Systems R & T	199-10-32 W83-70410 Bone Loss	Advanced Radar Concepts and Systems Study 677-29-18 W83-70526
506-56-75 W83-70180	199-20-31 W83-70416	Geobotanical Mapping in the Eastern United States
Advanced Power System Technology	Human Behavior and Performance 199-20-82 W83-70427	677-42-07 W83-70538
506-55-76 W83-70181 Thermal Management for On-Orbit Energy Systems	Man-Machine Engineering Requirements for Data and	SPECTRAL SENSITIVITY Coupled Active-Passive Sea Ice Analysis
506-55-77 W83-70182	Functional Interfaces	161 40-02 W83-70343
Multi-100 kW Low Cost Earth Orbital Systems 506-56-79 W83-70183	199-60-71 W83-70447 SPACELAB	Ground-Based Infrared Astronomy 196-41-50 W83-70394
SPACECRAFT PROPULSION	Advanced Equipment Development	Thematic Mapper Simulator Land Resources Studies in
Electric Propulsion Technology	199-80-31 W83-70450	Western Ecozones
500 55 32	SPACELAR PAVINANS	
506-56-22 W83-70168	SPACELAB PAYLOADS Development of a Shuttle Flight Experiment Drop Dynamics	677 21-26 W83-70515 SPECTRAL SIGNATURES
506-55-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169	Development of a Shuttle Flight Experiment Drop Dynamics Module	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science	SPECTRAL SIGNATURES FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83 70372
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph	SPECTRAL SIGNATURES FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83 70372 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 W83-70460
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS)	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449	SPECTRAL SIGNATURES FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83 70372 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 W83-70376 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 PACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS)	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 SPANWISE BLOWING F-4 Spanwise Blowing	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 W83-70374 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research 147-23-00 W83-70280 W83-70280
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 Fight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70221 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 W83-70374 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 W83-70376 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 906-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 906-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 W83-70374 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research 147-23-00 W83-70280 W83-70280
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 Fight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 Space Shuttle Orbiter Flying Qualities Criteria (OEX)	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Bassed Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 W83-70389 Intercompanison of Obson and Interferometric Spectrometer
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 906-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 906-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY)	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 Intercomparison of Oobson and Interferometric
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology V83-70208 V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment Development	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 W83-70389 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study W83-70526
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 906-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 906-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70218 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (DEX) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment Development 506-63-43 W83-70228	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 W83-70374 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70280 X-Ray Astronomy CCD Instrumentation Development 188 46-59 Intercomparison of Dobson and Interferometric Spectrometer 573-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology V83-70208 V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment Development	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 W83-70389 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study W83-70526
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70218 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Soutiel Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 W83-70226 High Resolution Accelerometer Package (HiRAP) Experiment Development 506-63-43 W83-70228 SPACECRAFT SHELDING Space Durable Composites and Thermal Control Surfaces 506-53-29	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Sparmise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 W83-70503 W83-70503 Variability and Trends in Stratospheric Ozone the Middle	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Bassed Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 Intercompanison of Dobson and Interferometre Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 W83-70531 Geological Applications of New Remote Sensing
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems	Development of a Shuttle Flight Experiment	FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 W83-70389 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 677-13-00 R83-70535
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology V83-70208 V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-49 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 W83-70136	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Geotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 V83-70504 SPATIAL TRESOLUTION W83-70504 SPATIAL RESOLUTION W83-70504 SPATIAL RESOLUTION	FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83-70372 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 W83-70376 Solar Physics Data Analysis and Operations 385-38-01 W83-70460 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70280 X-Ray Astronomy CCD Instrumentation Development 188-46-59 W83-70389 Intercompanison of Oobson and Interferometric Spectrometer 673-13-00 W83-70499 Advanced Radar Concepts and Systems Study 677-29-18 W83-70531 Geological Applications of New Remote Sensing Techniques 677-41-123 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-19 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (DEX) 506-63-40 W83-70226 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-33 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70389 X-Ray Astronomy CCD Instrumentation Development 188-46-59 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 177-41-23 SPECTROHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology V83-70208 V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-49 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 W83-70136	Development of a Shuttle Flight Experiment	FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83-70372 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 W83-70376 Solar Physics Data Analysis and Operations 385-38-01 W83-70460 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70280 X-Ray Astronomy CCD Instrumentation Development 188-46-59 W83-70389 Intercompanison of Oobson and Interferometric Spectrometer 673-13-00 W83-70499 Advanced Radar Concepts and Systems Study 677-29-18 W83-70531 Geological Applications of New Remote Sensing Techniques 677-41-123 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 906-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 906-60-19 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70210 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70211 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-34 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (DEX) 506-63-40 W83-70226 High Resolution Accelerometer Package (HiRAP) Experiment Development 506-53-43 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 W83-70136 Thermal Protection Systems for Earth-To-Orbit STS 506-53-33 Advanced Carbon-Carbon Panels 506-53-37 W83-70138	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 V83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 Development of Experiment and Hardware 188-38-51	SPECTRAL SIGNATURES FILE Flight Experiments - Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70389 X-Ray Astronomy CCD Instrumentation Development 188 46-59 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing 189-70-70-70-70-70-70-70-70-70-70-70-70-70-
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70210 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-34 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 W83-70226 Space Shuttle Orbiter Flying Qualities Criteria (OEX) Space Shuttle Orbiter Flying Qualities Criteria (OEX) Space Shottle Orbiter Flying Qualities Criteria (OEX) Space Shottle Orbiter Flying Qualities Criteria (OEX) Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS 506-53-33 Advanced Carbon-Carbon Panels 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS)	Development of a Shuttle Flight Experiment	FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83-70372 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 W83-70376 Solar Physics Data Analysis and Operations 385-38-01 W83-70460 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70280 X-Ray Astronomy CCD Instrumentation Development 188 46-59 W83-70389 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 Advanced Radar Concepts and Systems Study 677-29-18 W83-70531 Geological Applications of New Remote Sensing Techniques 677-41-14 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERY Optical Astronomy 196-41-71 W83-70399
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology Variable Thrust OTV Propulsion Technology Variable Thrust OTV Propulsion Technology Variable Thrust OTV Propulsion Technology V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 W83-70226 High Resolution Accelerometer Package (HiRAP) Experiment 506-53-43 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-37 W83-70137 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 W83-70137 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70504 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 W83-70517 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-21-24 W83-70513	FILE Flight ExperimentsAnalysis and Support 542-03-14 W83-70243 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 W83-70372 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 W83-70376 Solar Physics Data Analysis and Operations 385-38-01 W83-70460 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70280 X-Ray Astronomy CCD Instrumentation Development 188 46-59 W83-70389 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70526 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 W83-70531 Geological Applications of New Remote Sensing Techniques 677-41-23 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETRY Optical Astronomy 196-41-71 W83-70399 Data Analysis Astronomy 385-41-01 W83-70463
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-19 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS 506-63-34 OEX M83-7021 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 OEX M83-70221	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188-46-59 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 577-41-23 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 W83-70535 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Upper All Stronomy 196-41-71 Data Anallysis Astronomy 385-41-01 W83-70493
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 V83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 V83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 V83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 V83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 V83-70228 SPACECRAFT SHELDING Space Durable Composites and Thermal Control Surfaces 506-53-31 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-33 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 V83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-33 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 OEX Thermal Protection Experiments 506-63-36 SNACECRAFT SHBILITY Analysis and Design	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 W83-70157 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-29-14 W83-70513 Space Station Resource Observations Payload Study 677-29-14 W83-70524	FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Krand-Bassed Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 M83-70280 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 677-41-23 SPECTROPHOTOMETERS Intercompansion of Dobson and Interferometric Spectrometer 673-13-00 W83-70535 SPECTROPHOTOMETERS Intercompansion of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercompansion of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Intercompansion of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercompansion of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercompansion of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 W83-70493
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 W83-70207 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-49 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70218 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 Space Shuttle Orbiter Flying Qualities Criteria (DEX) 506-63-40 W83-70224 High Resolution Accelerometer Package (HiRAP) Experiment Development Development S06-53-43 W83-7028 SPACECRAFT SHELDING Space Durable Composites and Thermal Control Surfaces 506-53-39 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 W83-70137 Advanced Carbon-Carbon Panels 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Thermal Protection Experiments 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-36 SPACECRAFT STABILITY Analysis and Design 506-53-33 W83-70133	Development of a Shuttle Flight Experiment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70389 X-Ray Astronomy CCD Instrumentation Development 188 46-59 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 677-41-23 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 W83-70535 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTRORADIOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROSCOPIC ANALYSIS
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-42 System (IAPS) 542-05-12 W83-70216 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70220 High Resolution Accelerometer Package (HiRAP) Experiment Development 506-63-43 W83-70226 High Resolution Accelerometer Package (HiRAP) Experiment Development 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems Materials and Systems Evaluation 506-53-37 Near-70218 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-33 Advanced Carbon-Carbon Panels 506-53-37 Near-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 Nature Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 CEX Thermal Protection Experiments 506-63-35 PACECRAFT SHBILITY Analysis and Design 506-53-53	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 W83-70157 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-29-14 W83-70513 Space Station Resource Observations Payload Study 677-29-14 W83-70524	FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-42 System (IAPS) 542-05-12 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-32 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-34 W83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70220 Shuttle Upper Atmosphere Package (HiRAP) Experiment 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS 506-53-33 Advanced Carbon-Carbon Panels 506-53-37 SNattle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 Native Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 Native Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70135 Thermal Protection Experiments 506-53-37 Native Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 OEX Thermal Protection Experiments 506-63-35 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-36 W83-70137 Advanced Carbon-Carbon Panels 506-53-37 Native Infrared Reside Temperature Sensing (SILTS) 506-63-34 W83-70221 OEX Thermal Protection Experiments 506-52-53 W83-70223 SPACECRAFT STABILITY Analysis and Design 506-52-55 W83-70214	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01	FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Bassed Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188-46-59 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 677-41-23 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Optical Astronomy 196-41-71 Data Analysis Astronomy 197-198-198-198-198-198-198-198-198-198-198
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (OEX) S06-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS 506-63-34 OEX Thermal Protection Experiments 506-63-34 OEX Thermal Protection Experiments 506-63-36 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 OEX Thermal Protection Experiments 506-63-35 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-36 SPACECRAFT SHIELITY Analysis and Design 506-53-53 Planetary Aerocapture Systems Research and Technology Pevelopment 506-62-25 Solar Array Flight Experiment (SAFE) Dynamics & Control	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 Studies of Dynamics of Atmospheric Flows 146-76-00 Reduced Gravity Combustion Science 179-80-51 M93-70264 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70386 573-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-21-24 UR3-70524 Improved Rock Type Discrimination 677-41-03 Geobotanical Mapping in the Eastern United States 673-42-07 Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROSCOPIC ANALYSIS Upper Atmosphere Research - Laboratory Measurements 47-23-00 Atomic and Molecular Properties of Planetary Atmospheric Constituents
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology System (IAPS) 506-60-32 W83-70210 System (IAPS) 542-05-12 W83-70214 Space CRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-32 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-30 W83-70226 High Resolution Accelerometer Package (HiRAP) Experiment Development 506-53-43 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS 506-53-33 Advanced Carbon-Carbon Panels 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-36 W83-70135 Thermal Protection Experiments 506-53-37 W83-70136 Thermal Protection Experiments 506-63-36 W83-70223 SPACECRAFT STABILITY Analysis and Design 506-53-53 W83-70143 Planetary Aerocapture Systems Research and Technology Development 506-62-25 Solar Array Flight Experiment (SAFE) Dynamics & Control	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 W83-70517 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-21-24 W83-70513 Space Station Resource Observations Payload Study 677-29-14 W83-70529 Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment 677-42-07 W83-70548 SPECIFICATIONS	FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Bassed Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188-46-59 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 677-41-23 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Optical Astronomy 196-41-71 Data Analysis Astronomy 197-198-198-198-198-198-198-198-198-198-198
506-56-52 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 W83-70208 Variable Thrust OTV Propulsion Technology 506-60-19 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 W83-70248 PACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-34 W83-70220 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (DEX) 506-63-40 W83-70224 Space Shuttle Orbiter Flying Qualities Criteria (DEX) 506-63-40 W83-70228 PACECRAFT SHELDING Space Durable Composites and Thermal Control Surfaces 506-53-39 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 W83-70136 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 W83-70137 Advanced Carbon-Carbon Panels 506-53-37 W83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70210 CEX Thermal Protection Experiments 506-53-37 W83-70137 Advanced Carbon-Carbon Panels 506-53-33 W83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 OX83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-35-53 W83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 OX83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-35-53 W83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-35-53 W83-70137 Shutle Infrared Leeside Temperature Sensing (SILTS) 506-63-35-53 W83-70135 SPACECRAFT STRBILITY Analysis and Design 506-50-249 W83-70215 SPACECRAFT STRUCTURES	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70386 573-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-21-24 W83-70513 Space Station Resource Observations Payload Study 677-29-14 Improved Rock Type Discrimination 677-41-03 Geobotanical Mapping in the Eastern United States 677-42-07 W83-70538 Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment 677-60-15 W83-70548 Advanced Equipment Development	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70389 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 Geological Applications of New Remote Sensing Techniques 677-41-14 Geological Applications of New Remote Sensing Techniques 677-41-23 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTRORADIOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROSCOPIC ANALYSIS Upper Atmosphere Research - Laboratory Measurements 147-23-00 W83-70280 W83-70280 W83-70280 W83-70280
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology Variable Thrust OTV Propulsion Technology V83-70210 OTV Propulsion Performance and Plume Characterization 506-60-42 V83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 V83-70248 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-32 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 V83-70220 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 V83-70220 W83-70220 W83-70220 W83-70220 W83-70220 W83-70220 W83-70220 Space Shuttle Orbiter Flying Qualities Criteria (OEX) V83-70226 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 W83-70228 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 Thermal Protection Systems Materials and Systems Evaluation 506-53-37 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-37 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-33 Advanced Carbon-Carbon Panels 506-53-37 W83-70136 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-53-37 W83-70137 Advanced Carbon-Carbon Panels 506-53-37 W83-70138 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-53-37 W83-70221 SSACECRAFT SHBILITY Analysis and Design 506-53-53 W83-70223 SPACECRAFT STABILITY Analysis and Design 506-53-53 W83-70215 Solar Array Flight Experiment (SAFE) Dynamics & Control Augmentation (Flights 1 and 2) 506-62-49 SPACECRAFT STRUCTURES Detailed Aerothermal Loads	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70323 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 W83-70517 Development of Experiment and Hardware 188-38-51 Renewable Resources Field Research and Spacecraft Data Analysis 677-21-24 W83-70513 Space Station Resource Observations Payload Study 677-29-14 W83-70529 Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment 677-42-07 W83-70548 SPECIFICATIONS	FILE Flight Experiments Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Bassed Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 X-Ray Astronomy CCD Instrumentation Development 188 46-59 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 W83-70526 High Spectral Resolution Techniques for Geologic Mapping 677-41-23 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Upper Analysis Astronomy 385-41-01 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROPOLOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROPOLOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROSCOPIC ANALYSIS Upper Atmospheric Research - Laboratory Measurements 147-23-00 Atomic and Molecular Properties of Planetary Atmospheric Constituents 154-50-80 W83-70352
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-55-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 OTV Propulsion Performance and Plume Characterization 506-60-49 SPACECRAFT REENTRY Shuttle Entry Air Data System (SEADS) 506-63-39 SPACECRAFT REENTRY Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-30 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-31 Thermal Protection Systems Materials and Systems Evaluation 506-53-33 Advanced Carbon-Carbon Panels 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS 506-53-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-53-37 W83-70135 Thermal Protection Experiments 506-53-53 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-53-53 W83-70135 SPACECRAFT STABILITY Analysis and Design 506-53-55 SPACECRAFT STABILITY Analysis and Design 506-53-55 SPACECRAFT STABILITY Analysis and Design 506-53-63 W83-70215 SPACECRAFT STRUCTURES Detailed Aerothermal Loads 506-51-23 Hypervelocity Impact Resistance of Composite Materials	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70386 S73-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-31-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 Development of Experiment and Hardware 188-38-51 W83-70513 Space Station Resource Observations Payload Study 677-29-14 W83-70524 Improved Rock Type Discrimination 677-41-03 W83-70524 Improved Rock Type Discrimination 677-41-03 W83-70538 Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment 678-60-15 W83-70548 SPECIFICATIONS Advanced Equipment Development 199-80-31 Large Primate Facility 199-80-52 W83-70454	FILE Flight Experiments - Analysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70389 Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing 1677-41-14 Geological Applications of New Remote Sensing 1677-41-12 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70535 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Intercompanison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Gas Correlation W83-70499 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROSCOPIC ANALYSIS Upper Atmosphere Research - Laboratory Measurements 147-23-00 Atomic and Molecular Properties of Planetary Atmospheric Constituents 154-50-80 W83-70352 Planetary Astronomy and Supporting Laboratory Research 164-1-67 W83-70397
506-56-22 W83-70168 Electric Propulsion Thruster Subsystem R&T 506-56-25 W83-70169 Advanced Manned Vehicle Onboard Propulsion Technology 506-60-17 Reusable High Pressure Main Engine Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-19 Variable Thrust OTV Propulsion Technology 506-60-42 W83-70210 OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211 Flight Test of an Ion Auxiliary Propulsion System (IAPS) 542-05-12 Shuttle Entry Air Data System (SEADS) 506-63-32 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-37 Shuttle Upper Atmosphere Mass Spectrometer (SUMS) 506-63-39 Shuttle Orbiter Flying Qualities Criteria (OEX) 506-63-40 High Resolution Accelerometer Package (HiRAP) Experiment 506-63-43 SPACECRAFT SHIELDING Space Durable Composites and Thermal Control Surfaces 506-53-29 W83-70135 Thermal Protection Systems Materials and Systems Evaluation 506-53-31 Thermal Protection Systems for Earth-To-Orbit STS 506-63-34 OEX Thermal Protection Experiments 506-63-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 OEX Thermal Protection Experiments 506-53-35 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-37 Shuttle Infrared Sensing (SILTS) 506-63-39 SPACECRAFT SHBILITY Analysis and Design 506-53-55 SPACECRAFT SHBILITY Analysis and Design 506-53-55 Design W83-70215 SPACECRAFT STRUCTURES Detailed Aerothermal Loads 506-51-23 W83-70215	Development of a Shuttle Flight Experiment Drop Dynamics Module 542-03-01 W83-70241 Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264 Reduced Gravity Combustion Science 179-80-51 W83-70366 Advanced Mission Study - Solar X-Ray Pinhole Satellite and Long Focal Length Coronagraph 188-78-38 W83-70391 Sample Bank 199-70-32 W83-70449 Large Primate Facility 199-80-52 W83-70454 SPANWISE BLOWING F-4 Spanwise Blowing 533-02-33 W83-70104 SPARK CHAMBERS Gamma Ray Astronomy 188-46-57 W83-70386 SPATIAL DISTRIBUTION Giotto Dust Impact Detection System (DIDSY) 156-03-07 W83-70303 Investigation of Upper Atmosphere Dynamics with Nimbus 7 Satellite Data 673-31-00 W83-70503 Variability and Trends in Stratospheric Ozone the Middle Atmosphere and UV Solar Flux Variations 673-41-00 W83-70504 SPATIAL RESOLUTION Multifunction SAR Technology 506-54-27 W83-70513 Renewable Resources Field Research and Spacecraft Data Analysis 677-21-24 W83-70524 Improved Rock Type Discrimination 677-41-03 Geobotanical Mapping in the Eastern United States 677-42-07 Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment 677-60-15 SPECIFICATIONS Advanced Equipment Development 199-80-31 Large Primate Facility	SPECTRAL SIGNATURES FILE Flight ExperimentsAnalysis and Support 542-03-14 SPECTROHELIOGRAPHS Development of Solar Experiments and Hardware 188-38-51 Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Theoretical Solar Physics 188-38-53 Solar Physics Data Analysis and Operations 385-38-01 SPECTROMETERS Upper Atmosphere Research Laboratory Measurements 147-23-00 W83-70380 X-Ray Astronomy CCD Instrumentation Development 188-46-59 Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 Advanced Radar Concepts and Systems Study 677-29-18 High Spectral Resolution Techniques for Geologic Mapping 677-41-14 Geological Applications of New Remote Sensing Techniques 677-41-23 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 W83-70499 SPECTROPHOTOMETERS Intercomparison of Dobson and Interferometric Spectrometer 673-13-00 SPECTROPHOTOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTRORADIOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTRORADIOMETERS Gas Correlation Wind Sensor 147-18-02 SPECTROSCOPIC ANALYSIS Upper Atmosphere Research - Laboratory Measurements 17-23-00 W83-70350 W83-70310 Development of Resonant Ionization Laser Spectroscopy for Tropospheric Nox Measurements 178-40-03 Planetary Astronomy and Supporting Laboratory Research

Quantitative Infrared Spectroscopy of Minor Constitu	ents of	STRATOSPHERE		STRUCTURAL VIBRATION	
the Earth's Stratosphere 147-20-03 W83	-70276	Atmospheric Processes Experiments and Sys 147-10-03	tems W83-70265	Payloads Definition Methods 506-53-56	W83-70145
Infrared Laboratory Spectroscopy in Support of Strate		Stratospheric Research Balloon Laser In-Situ	Sensor	SUBMERGING	
Measurements 147-23-08 W83	-70281	147-11-04 In-Situ Measurements of Stratospheric Ozone	W83-70267	Crew Health Maintenance 199-10-32	W83-70410
Laser Laboratory Spectroscopy 147-23-09 W83	-70282	147-11-05 Upper Atmosphere Research - Field Measure	W83-70268	Cardiovascular Deconditioning 199-20-12	W83-70413
Millimeter/Submillimeter Laboratory Spectroscopy	70283	147-12-00	W83-70269	SUBMILLIMETER WAVES	
Upper Atmosphere Research - Satellite Data Analysi	s	Stratospheric Fourier Spectroscopy at Nea Wavelengths	rand Mid IR	Submillimeter & Optical Processing Device R 506-54-12	W83-70148
147-41-00 W83 Spectroscopic Properties of the Stratosphere	-70287	147-12-05 Stratospheric Research Field Measurem	W83-70270	Electronics Research and Technology 506-54-15	W83-70150
	70289	Millimeter and Submillimeter Radiometry	-	Acousto-Optic & Submillimeter Device Techr 506-54-16	
Background Determination Neutron Transport Calculat		147-12-06 Pressure Modulator Radiometer	W83-70271	Study of Large Deployable Reflector for	
Planetary Evaluation and Dynamic Studies 153-03-50 W83	70301	147-12-08 Multi-Sensor Balloon Measurements	W83-70272	Submillimeter Astronomy 506-62-21	W83-70212
Oynamics of Planetary Atmospheres 154-20-80 W83-	70309	147-16-01	W83-70274	Stratospheric Research Field Measurem Millimeter and Submillimeter Radiometry	ents Program
Crustal Magnetic Field Representation and Verification	on .	Gas Correlation Wind Sensor 147-18-02	W83-70275	147-12-06	W83-70271
677-45-06 W83- SPHERICAL HARMONICS	70542	Quantitative Infrared Spectroscopy of Minor (the Earth's Stratosphere	Constituents of	Millimeter/Submillimeter Laboratory Spectros 147-23-10	scopy W83-70283
Upper Atmosphere Research - Satellite Data Analysi	s 70287	147-20-03	W83-70276	Infrared and Sub-Millimeter Astronomy 188-41-55	W83-70382
SPHERICAL SHELLS	70207	Measurements	action Rate	Radio Astronomy	
Spherical Shell Technology Study 179-20-57 W83-	70358	147-21-00 Chemical Kinetics of the Upper Atmosphere	W83-70277	196-41-73 SUBROUTINE LIBRARIES (COMPUTERS)	W83-70400
SPIN High Performance Aircraft Flight Dynamics & Contro	le	147-21-03	W83-70278	MPP - Systems Software R & T 506-54-56	W83-70159
505-43-13 W83	70071	Photochemistry of the Upper Atmosphere 147-22-01	W83-70279	SUBSONIC FLOW	
Forward Swept Wing Support 533-02-83 W83-	70112	Infrared Laboratory Spectroscopy in Support o Measurements	f Stratospheric	Computational Methods and Application Dynamics	ins in Fluid
SPRINGS (ELASTIC) Decoupler Pylon Flight Evaluation		147-23-08	W83-70281	505-31-01 Computational and Analytical Fluid Dynamics	W83-70001
533-02-71 W83-	70109	Laser Laboratory Spectroscopy 147-23-09	W83-70282	505-31-03	W83-70003
STABILITY DERIVATIVES High Performance Aircraft Flight Dynamics and	Flying	Millimeter/Submillimeter Laboratory Spectros 147-23-10	copy W83-70283	SUBSONIC SPEED Propeller Research	
Qualities 505-43-11 W83-	70070	Stratospheric Research 147-30-02	W83-70284	505-40-32 SUBSONIC WIND TUNNELS	W83-70058
STABLE OSCILLATIONS		General Circulation Modeling of the Stratosph	nere	Low Speed Wind Tunnel Operations	W(02 70067
Development of Experiments and Hardware for Solar Research		147-32-00 Upper Atmosphere Research - Satellite Data	W83-70286 Analysis	505-42-81 SUN	W83-70067
188-38-51 W83- STANDARDS	70370	147-41-00 Critical Examination of Upper Stratospheric	W83-70287	Planetary Materials Analysis 152-01-40	W83-70293
Solar Irradiance Rocket Experiment	70495	147-43-00	W83-70288	Development of Experiment and Hardware 188-38-51	W83-70371
STAR CLUSTERS		Spectroscopic Properties of the Stratosphere 147-44-00	W83-70289	Ground-Based Observations of the Sun	
Formation Evolution and Stability of Proto-Stella 153-01-60 W83-	r Disks 70298	Assessment of Ozone Perturbations 147-51-00	W83-70290	188-38-52 Structure and evolution of Solar Magnetic Fiel	W83-70373 Ids (Laboratory
STARS Sounding Rockets Experiments (Astronomy)		Data Survey and Evaluation	W83-70291	& Theory for Solar Physics) 188-38-53	W83-70375
879-11-41 W83-	70552	147-51-02 Investigation of Upper Atmosphere Dynamics v		Experiment Development - Laboratory and Th	
STATIC FIRING Engine Systems Facilities Operations		Satellite Data 673-31-00	W83-70503	Physics 188-38-53	W83-70376
505-40-70 W83- STATIC LOADS	70062	Variability and Trends in Stratospheric Ozon Atmosphere and UV Solar Flux Variations		STARPROBE - Advanced Technology Ma Planning	anagement &
Forward Swept Wing Support	20110	673-41-00	W83-70504	188-78-38	W83-70390
STATISTICAL ANALYSIS	70112	STRESS (PHYSIOLOGY) Cardiovascular Deconditioning (JSC)		Climate Observations 672-40-00	W83-70494
Verification and Analysis of Satellite Derived Product 146-71-00 W83-	s 70257	199-20-11 Cardiovascular Deconditioning	W83-70412	SUPERCONDUCTIVITY Superconducting Gravity Gradiometer	
Time Dependent Fields	70338	199-20-12	W83-70413	676-59-33 SUPERCRITICAL FLOW	W83-70511
STEADY FLOW	70336	STRESS CONCENTRATION Regional Crustal Deformation		High-Speed Aerodynamics and Propulsion Int	
Computational Fluid Dynamics for Turbomachinery 505-31-02 W83-	70002	676-10-10 STRESS CORROSION	W83-70506	505-43-23 SUPERCRITICAL WINGS	W83-70073
STELLAR ATMOSPHERES UV and Optical Astronomy		Life Predicton Fatigue Damage and Environ	mental Effects	Advanced Turboprop-Installation Aerodynamic 535-03-11	cs W83-70121
188-41-51 W83-	70380	in Metals and Composites 505-33-21	W83-70020	SUPERHIGH FREQUENCIES	W43-70121
Data Analysis Astronomy 385-41-01 W83-	70463	STRESS MEASUREMENT Propulsion Instrumentation		X-Band Uplink Development 310-20-64	W83-70564
STELLAR EVOLUTION UV and Optical Astronomy		505-31-52	W83-70014	Antenna Systems Development 310-20-65	W83-70565
188-41-51 W83-	70380	STRESS-STRAIN RELATIONSHIPS Fundamentals of Mechanical Behavior of	of Composite	Radio Systems Development	
STELLAR LUMINOSITY Climate Observations		Matrices 506-53-15	W83-70129	310-20-66 SUPERSONIC AIRCRAFT	W83-70566
	70494	STRUCTURAL ANALYSIS Mathematics for Engineering and Science		Supersonic Aerodynamics Configuration Structures & Materials Technology	s Integration
Formation Evolution and Stability of Proto-Stella		505-31-83	W83-70016	505-43-43	W83-70078
STELLAR MODELS	70298	Research in Advanced Material Concepts fo 505-33-10	or Aeronautics W83-70017	SUPERSONIC COMBUSTION RAMJET ENGIN High Speed (Super/Hypersonic) Technology	
UV and Optical Astronomy 188-41-51 W83-	70380	Computer-Aided Design 505-37-13	W83-70050	505-43-83 SUPERSONIC FLIGHT	W83-70082
STEREOPHOTOGRAPHY	Aission	Rotorcraft Airframe Systems 505-42-23	W83-70065	Experimental/Applied Aerodynamics 505-31-23	W83-70008
Requirements/Feasibility Study		Advanced Space Structures		High-Speed Aerodynamics and Propulsion Into	egration
Digital Topographic Mapping N	70522 Aission	506-53-43 STRUCTURAL DESIGN	W83-70140	505-43-23 Supersonic Propulsion Integration Technology	W83-70073
Requirements/Feasibility Study	70523	Research in Advanced Material Concepts fo 505-33-10	or Aeronautics W83-70017	505-43-42 Highly Maneuverable Aircraft Technology F	W83-70077
Topographic Mapping Methods		STRUCTURAL DESIGN CRITERIA	W83-70017	533-03-11	W83-70114
STORAGE TANKS	70540	Hypersonic Aeronautics Technology 505-43-81	W83-70080	SUPERSONIC FLOW Computational Methods and Application	ns in Fluid
Advanced Space Structures 506-53-43 W83-	70140	STRUCTURAL ENGINEERING		Dynamics 505-31-01	W83-70001
In-Space Fluid Management Technology - Goddard S	upport	Advanced Space Structural Concepts 506-53-40	W83-70139	SUPERSONIC INLETS	
STORMS	70236	STRUCTURAL PROPERTIES (GEOLOGY) Oil and Gas Test Case Study		Hypersonic Propulsion Integration Technology \$05-43-82	W83-70081
Severe Storms and Local Weather Research 175-13-00 W83-	70346	677-41-16 STRUCTURAL STABILITY	W83-70532	SUPERSONIC WIND TUNNELS	
STORMS (METEOROLOGY) Aviation Safety Severe Storm Hazards	-	Loads and Aeroelasticity	W93 70000	Wind Tunnel Operations 505-40-72	W83-70063
505-45-03 W83-	70085	505-33-43 Advanced Structural Analysis Methods	W83-70028	High-Speed Wind Tunnel Operations 505-43-61	W83-70079
Development of New Remote Data Interpre Techniques		505-33-53 Advanced Space Structures	W83-70029	SUPPORT SYSTEMS	
	70347	506-53-43	W83-70140	Human Factors Facilities Operations 505-35-01	W83-70036
175-40-00 W83-	70348	Development	Technology	Flight Support	
STRAIN GAGES Structures Analysis and Synthesis		506-53-45 Advanced Large Spacecraft Systems Analysis	W83-70141	533-02-91 Human-to-Machine Interface Technology	W83-70113
	70142	506-62-23	W83-70213	310-40-37	W83-70572

Mission Operations Technology	14/00 20570	SYSTEMS ENGINEERING	Regional Crustal Deformation
310-40-45	W83-70573	Advanced Earth Orbiter Radio Metric Technol Development	
SUPPORTS Study of Large Deployable Reflector for	Infrared and	161-10-03 W83-70	Lithospheric Structure and Evolution 676-30-05 W83-70507
Submillimeter Astronomy		Manned Facilities (Space Station)	TELECOMMUNICATION
506-62-21	W83-70212	906-58-00 W83-70 Tethered Satellite System (TSS) (System Developm	ridge resimied commission for reconduces (in ori
SURFACE REACTIONS Surface Physics and Computational Chemistry	,	906-70-00 W83-70	
506-53-11	W83-70127	SYSTEMS INTEGRATION	646-41-01 W83-70471
SURFACE ROUGHNESS EFFECTS		RSRA Flight Research/Rotors 532-03-11 W83-70	Geostationary Platform Bus Definition
Detailed Aerothermal Loads		Advanced Fighter Technology Integration/F	
506-51-23	W83-70125	(AFTI-F-111)	Automation Technology for Planning Teleoperation and
SURFACE TEMPERATURE Shuttle Infrared Leeside Temperature Sensing	(SUTS)	533-02-11 W83-70	101 Robotics
506-63-34	W83-70221	AFTI/F-16 533-02-61 W83-70	506-54-65 W83-70162
Infrared Imagery of Shuttle		Teleoperator and Robotics System Analysis	Communications Systems Technology Development 310-20-67 W83-70567
506-63-35	W83-70222	506-64-23 W83-76	High-Speed Signal Processing Research
Numerical Analysis of Remote Sensing Data	W83-70255	Life Support Systems Technology Development	310-30-70 W83-70570
146-66-01		506-64-37 W83-70 Tethered Satellite System (TSS) (System Develops	
Ocean Processes Branch Scientific Program 5 161-50-02	W83-70345	906-70 00 W83-70	
Climate Observations		Deployable Antenna Flight Experiment	Automation Technology for Planning Teleoperation and
672-40-00	W83-70494	906-90-00 W83-70 SYSTEMS MANAGEMENT	
SWEPT FORWARD WINGS Low Speed Wind Tunnel Operations		Operations Support Computing Technology	506-54-65 W83-70162 STS Control and Guidance Technology Development
505-42-81	W83-70067	310-40 26 W83-76	0571 506-57 17 W83-70187
Support for Forward Swept Wing (X-29A)		Systems Management Technology	Manned Control of Remote Operations
533-02-81	W83-70111	310 40-49 W83-70 SYSTEMS SIMULATION	
Forward Swept Wing Support 533-02-83	W83-70112	Sensor Research and Technology	Teleoperator Human Interface Technology 506-57-25 W83-70191
SWITCHING	1100-70112	506-54 26 W83-70	
Satellite Switching and Processing Systems		Future Data Systems Concepts	506-57 29 W83-70193
650-60-21	W83-70475	506-58-11 W83-70 Propagation Studies and Measurements	release and made of the mary sig
SYNCHRONISM Shuttle Time and Frequency Transfer Expe	riment (STIFT)	643-10-03 W83-70	506-64-23 W83-70234 Various and Cryogenic Fluid Management
676-59-41	W83-70512	Global Climate Model Development and Applications	506 64 29 W83-70238
SYNCHRONOUS PLATFORMS		672-30-00 W83-7	O493 Ground Operations Associated with Special Flight
Geostationary Platform Bus Definition	W92 70505	SYSTEMS STABILITY Systems Management Control and Ecological Considera	Demonstrations
906-90-03 SYNOPTIC MEASUREMENT	W83-70595	for CELSS	tions 906-64-23 W83-70587 Teleoperator Maneuvering System
Meteorological Observing System Developme	ent	199-60 62 W83-76	0446 906-75 00 W83-70591
146-73-00	W83-70262		TELESCOPES
SYNOPTIC METEOROLOGY		Т	Study of Large Deployable Reflector for Infrared and
Severe Storms and Local Weather Research 175-13-00	W83-70346	·	Submillimeter Astronomy 506 62 21 W83-70212
SYNTHETIC APERTURE RADAR		T-37 AIRCRAFT	The Search for Extraterrestrial Intelligence
Electronics Research and Technology		Flight Support	199-50-62 W83-70439
506-54-15	W83-70150	533-02-91 W83-76	113 TEMPERATURE CONTROL Thermal Management for On-Orbit Energy Systems
Multifunction SAR Technology 506-54-27	W83-70157	T-38 AIRCRAFT Flight Support	506 55 77 W83-70182
Data Systems Research and Technology		533-02-91 W83-76	
506-58-15	W83-70197	TAKEOFF	Submillimeter Astronomy
Coupled Active-Passive Sea Ice Analysis 161-40-02	W83-70343	Propulsive-Lift Technology - QSRA Flight Experiments 533-02-50 W83-76	506 62 21 W83-70212 3106 Advanced Thermal Control Technology for Croyogenic
SAR Data System Research and Developmen		533-02-50 W83-76 Advanced Transport Operating Systems	Propellant Storage
656-44-03	W83-70484		0118 506-64-25 W83-70235
656-44-03	1100-70404	934-04-13 VVB3-71	
Land Cover Multisensor Analysis		TANGENTS	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25	W83 70514	TANGENTS Solar and Heliospheric Physics Data Analyses	Space Station Life Support Technology 506-64-31 W83-70239
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development		TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 W83-76	Space Station Life Support Technology 506-64-31 W83-70239 Life Support Systems Technology Development
Land Cover Multisensor Analysis 677-21-25	W83 70514 W83-70516	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 W83-70 TDR SATELLITES	Space Station Life Support Technology 506-64-31 W83-70239 Life Support Systems Technology Development 506-64-37 W83-70240
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29	W83 70514 W83-70516 W83-70517	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 W83-7i TDR SATELLITES Communications 506-58-26 TDRSS Follow-On/Intersatellite W83-7i	Space Station Life Support Technology 506-64-31 W83-70239 Utellife Support Systems Technology Development 506-64-37 W83-70240 Utellife Support Systems Technology Development W83-70240 Utellife Support Systems Technology Development W83-70240 Utellife Support Technology W83-70240 Utellife Support Technology W83-70239 Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technology Utellife Support Technol
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping	W83 70514 W83-70516	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development W83-70	Space Station Life Support Technology 506-64-31 W83-70239
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study	W83 70514 W83-70516 W83-70517	TANGENTS Solar and Hetiospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 W83-7 W83-7	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 Upper Atmosphere Research - Satellite Data Analysis Satel
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping	W83-70516 W83-70517 Mission	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development W83-70	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 Upper Atmosphere Research - Satellite Data Analysis 147-41-00 W83-70287 X-Ray Astronomy CCD Instrumentation Development W83-70287 W83-70287
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking on Tracking and Data Refay Satellite (TDRS) 310-20-39 W83-7	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 W83-7i TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 Upper Attmosphere Research - Satellite Data Analysis Life
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523	TANGENTS Solar and Hetiospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netv 310 20-46	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 Upper Attmosphere Research - Satellite Data Analysis Life
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 Y	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 W83-7i TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 W83-70145 Upper Atmosphere Research - Satellite Data Analysis 147-41-00 W83-70287 X-Ray Astronomy CCD Instrumentation Development 188-46-59 TEMPERATURE EFFECTS Analysis and Design 506-53-53 W83-70143 Ouanitative Infrared Spectroscopy of Minor Constituents of
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology W83-70	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 W83-70145 Upper Atmosphere Research - Satellite Data Analysis 147-41-00 W83-70287 W83-70287 W83-70287 W83-70389 W83-70389 TEMPERATURE EFFECTS Analysis and Design 506-53-53 W83-70143 Cuantitative Infrared Spectroscopy of Minor Constituents of the Earth's Stratosphere W83-70143 W83-70143 Cuantitative Infrared Spectroscopy of Minor Constituents of the Earth's Stratosphere W83-70143 W83-70143
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 y W83-70526 W83-70539 f SAR Images	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 W83-76	Space Station Life Support Technology 506-64-37
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Vary Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-27 TEA LASERS	Space Station Life Support Technology 506-64-37
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 y W83-70526 W83-70539 f SAR Images	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 W83-7i TDR SATELLITES Communications 506-58-26 W83-7i Network Systems Technology Development 310-20-33 Was-7i Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 W83-7i Advanced Space Systems for Users of NASA Network 310 20-46 W83-7i Operations Support Computing Technology 310-40-26 W83-7i Human-to-Machine Interface Technology 310-40-37 W83-7i TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 W83-7i	Space Station Life Support Technology 506-64-31 Life Support Systems Technology Development 506-64-37 W83-70240 TEMPERATURE DISTRIBUTION Payloads Definition Methods 506-53-56 W83-70145 Upper Atmosphere Research - Satellite Data Analysis 147-41-00 W83-70287 X-Ray Astronomy CCD Instrumentation Development 188-46-59 TEMPERATURE EFFECTS Analysis and Design 506-53-53 W83-70143 Uannitative Infrared Spectroscopy of Minor Constituents of the Earth's Stratosphere 147-20-03 Experimental Magnetism 153-08-50 W83-70305 TEMPERATURE GRADIENTS W83-70305 TEMPERATURE GRADIENTS W83-70305 TEMPERATURE GRADIENTS W83-70305 W83-70305
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 f SAR Images W83-70543 W83-70544	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 W83-70 TECHNOLOGY ASSESSMENT	Space Station Life Support Technology 506-64-37 W83-70249
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Arborone Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 Y W83-70526 W83-70526 W83-70543	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion	Space Station Life Support Technology 506-64-37
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Airborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-03	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 f SAR Images W83-70543 W83-70544	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 W83-70 TECHNOLOGY ASSESSMENT	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 Y W83-70526 W83-70539 f SAR Images W83-70544 W83-70544	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-27 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 W83-76	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 f SAR Images W83-70544 W83-70545 W83-70545 W83-70546 Systems	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Vary Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 W83-70 Advanced Large Spacecraft Systems Analysis	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 Y W83-70526 W83-70539 f SAR Images W83-70544 W83-70544	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 W83-76	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Arborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 Y W83-70526 W83-70539 f SAR Images W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Propert Computing Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport W83-70 Advanced Requirements for Advanced Space Transport W83-70 Advanced Requirements for Advanced Space Transport	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Airborne Radar Operations 677-48-03 ER SEASAT Digital SAR Processing 677-48-03 System Fallures Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70526 W83-70526 W83-70543 W83-70544 W83-70546 Systems W83-70164 W83-70164	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 W83-76	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-43-03 Aiborne Radar Operations 677-48-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 f SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 606-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23	W83-70514 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 f SAR Images W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across Fermanently Orbiting Space Stations	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Arborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 ff SAR Images W83-70544 W83-70544 W83-70546 Systems W83-70164 W83-70164 W83-70198 i W83-70198 i W83-70198	TAMGENTS Solar and Heliospheric Physics Data Analyses 365-38-01 VW33-71 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-63-23 VW33-76 Technology Requirements for Advanced Space Transport Systems 506-63-23 VW33-76 Technology Systems Analysis Across Disciplines Permanently Orbiting Space Stations 506-64-13 WW33-76 WW33-76	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-48-03 ER SEASAT Digital SAR Processing 677-48-03 System Fallures Automations Technology for Manned Space S 606-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-63-23 Technology Requirements for Advanced Space Systems 506-63-23	W83-70514 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70529 #SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications TDRSS Follow-On/Intersatellite 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-27 TEA LASERS Troposphene Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 W83-70 Advanced Large Spacecraft Systems Analysis 506-62-23 W83-70 Technology Requirements for Advanced Space Transport. Systems 506-63-23 Technology Systems Analysis Across Disciplines Permanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Oigital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Auborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D	W83-70514 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70529 #SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Rediant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across Disciplines Fermanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology 506-0-20 W83-70	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-48-03 ER SEASAT Digital SAR Processing 677-48-03 System Fallures Automations Technology for Manned Space S 606-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-63-23 Technology Requirements for Advanced Space Systems 506-63-23	W83-70514 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70529 #SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (At System Studies)	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Arborone Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology	W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70539 if SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 if W83-70213 Transportation W83-70216 Usciplines for W83-70230	TAMGENTS Solar and Heliospheric Physics Data Analyses 365-38-01 W83-71 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 W83-74 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 W83-76 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 W83-76 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 W83-76 Technology Requirements for Advanced Space Transport. Systems 506-63-23 Technology Systems Analysis Across Disciplines Fermanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology 650-60-26 W83-76 Advanced Communications Technology Satellite (All System Studies	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-03 System FAILURES Automations Technology for Manned Space S 606-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-15	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 if SAR Images W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 if W83-70213 Transportation W83-70216 insciplines for	TANGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310-20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Troposphenc Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across Permanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology 650-60-20 W83-70 Advanced Communications Technology Satellite (All System Studies 650-60-62 TECHNOLOGY TRANSFER	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Origital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Arborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-15	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 of SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 iw83-70198 iw83-70213 Transportation W83-70216 insciplines for W83-70230 W83-70231	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis S06-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Requirements for Advanced Space Transport Systems 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (At System Studies 650-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-49-02 Arborne Radar Operations 677-48-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-64-13 Spacecraft System Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-19 Fielform Systems Study 506-64-19	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 f SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70198 in W83-70164 W83-70198 in W83-70164 W83-70198 in W83-70164 W83-70198 W83-70213 Transportation W83-70216 Disciplines for W83-70230 W83-70231	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 906-55-76 Advanced Large Spacecraft Systems Analysis So6-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across Disciplines Permanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology Advanced Communications Technology Satellite (AI) System Studies 505-60-26 W83-70 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-13 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-23	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 of SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 iw83-70198 iw83-70213 Transportation W83-70216 insciplines for W83-70230 W83-70231	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis S06-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Requirements for Advanced Space Transport Systems 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (At System Studies 650-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-48-02 Authorine Radar Operations 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space So6-64-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-13 Network Monitor and Control Technology	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 Transportation W83-70216 disciplines for W83 70230 W83-70231 W83-70234	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across Disciplines Permanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (AI) System Studies 650-60-26 W83-70 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-102 TECHNOLOGY UTILIZATION	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-129 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-13 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-23	W83-70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 Y W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216 Disciplines for W83-70230 W83-70231 W83-70232 W83-70234 W83-70234	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Requirements for Advanced Space Transport Systems 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (At System Studies 650-60-26 W83-70 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity W83-70 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity W83-70 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity W83-70 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-64-13 Spacecraft System Technology 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-23 Network Monitor and Control Technology 310-30-69 Operations Support Computing Technology 310-30-69	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 Transportation W83-70216 disciplines for W83 70230 W83-70231 W83-70234	TAMGENTS Solar and Heliospheric Physics Data Analyses 365-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 W83-76 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 W83-76 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across 506-64-13 Space Communications Systems Antenna Technology 650-60-20 W83-76 Advanced Communications Technology Satellite (All System Studies 650-60-26 W83-76 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 W83-76 Commercial Materials Processing in Low-Gravity 179-60-62 W83-76 Commercial Materials Processing in Low-Gravity 179-60-62 W83-76	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-13 Lise of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-46-02 Airborne Radar Operations 677-47-03 ER SEASAT Digital SAR Processing 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 606-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Requirements for Advanced Space Systems 506-64-13 Space Spacecraft System Analysis Across D Permanently Orbiting Space Stations 506-64-19 Teleoperator and Robotics System Analysis 506-64-23 Network Monitor and Control Technology 310-30-69 Operations Support Computing Technology 310-30-69 Space Platform Specilication Development	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70539 If SAR Images W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216 Disciplines for W83 70230 W83-70231 W83-70231 W83-70232 W83-70234 W83-70569 W83-70571	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (Al System Studies 550-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 506-62-62 Applications Experiments Program Support 507-50-60-62 Applications Experiments Program Support 508-70	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-43-10 Arborne Radar Operations 677-48-02 Arborne Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-64-13 Spacecraft System Technology 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-23 Network Monitor and Control Technology 310-30-69 Operations Support Computing Technology 310-30-69 Operations Support Computing Technology 310-40-26 Space Platform Specification Development 906-50-00	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 Systems W83-70216 Disciplines for w83 70230 W83-70231 W83-70231 W83-70234 W83-70234 W83-70571 W83-70577	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TDR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Power System Technology 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (Al System Studies 550-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 506-62-62 Applications Experiments Program Support 507-50-60-62 Applications Experiments Program Support 508-70	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-48-02 Authorine Radar Operations 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space Soficial Systems Research and Technology 506-54-16 Systems Analysis Data Systems Research and Technology 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Requirements for Advanced Space Systems 506-64-13 Spacecraft System Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-13 Network Monitor and Control Technology 310-30-69 Operations Support Computing Technology 310-40-26 Space Phatform Specification Development 906-50-00 System Analysis and Evaluation of Perman	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216 disciplines for W83 70230 W83-70231 W83-70231 W83-70232 W83-70234 W83-70234 W83-70569 W83-70577 dentity Manned	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Radiant Energy Conversion 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (Al System Studies 550-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHONICS Planetary Petrology	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis o 677-46-02 Arborne Radar Operations 677-48-01 Spatial Radar Image Registration 677-48-01 Spatial Radar Image Registration 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space S 506-54-67 SYSTEMS ANALYSIS Data Systems Research and Technology 506-58-16 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Systems Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-13 Platform Systems Study 506-64-23 Network Monitor and Control Technology 310-30-69 Operations Support Computing Technology 310-40-26 Space Platform Specification Development 906-50-00 System Analysis and Evaluation of Perman Orbiting Space Facilities	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 Systems W83-70216 Disciplines for w83 70230 W83-70231 W83-70231 W83-70234 W83-70234 W83-70571 W83-70577	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Netw 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Rediant Energy Conversion 506-55-13 Advanced Rediant Energy Conversion 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across Disciplines Fermanently Orbiting Space Stations 506-64-13 Space Communications Systems Antenna Technology 650-60-20 W83-70 Advanced Communications Technology Satellite (Aid System Studies 650-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECTONICS Planetary Petrology 153-02-40 W83-70	Space Station Life Support Technology
Land Cover Multisensor Analysis 677-21-25 Multisensor Technique Development 677-21-28 Land Resources Applied Research 677-21-29 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Digital Topographic Mapping Requirements/Feasibility Study 677-29-12 Advanced Radar Concepts and Systems Stud 677-29-18 Use of SAR for Geologic Mapping 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-43-16 New Techniques for Quantitative Analysis of 677-48-02 Authorine Radar Operations 677-48-03 SYSTEM FAILURES Automations Technology for Manned Space Soficial Systems Research and Technology 506-54-16 Systems Analysis Data Systems Research and Technology 506-62-23 Technology Requirements for Advanced Space Systems 506-63-23 Technology Requirements for Advanced Space Systems 506-64-13 Spacecraft System Analysis Across D Permanently Orbiting Space Stations 506-64-13 Spacecraft System Technology 506-64-19 Teleoperator and Robotics System Analysis 506-64-13 Network Monitor and Control Technology 310-30-69 Operations Support Computing Technology 310-40-26 Space Phatform Specification Development 906-50-00 System Analysis and Evaluation of Perman	W83 70514 W83-70516 W83-70517 Mission W83-70522 Mission W83-70523 W83-70526 W83-70526 W83-70543 W83-70544 W83-70545 W83-70546 Systems W83-70164 W83-70198 W83-70213 Transportation W83-70216 disciplines for W83 70230 W83-70231 W83-70231 W83-70232 W83-70234 W83-70234 W83-70569 W83-70577 dentity Manned	TAMGENTS Solar and Heliospheric Physics Data Analyses 385-38-01 TOR SATELLITES Communications 506-58-26 Network Systems Technology Development 310-20-33 Very Long Baseline Interferometry (VLBI) Tracking of Tracking and Data Relay Satellite (TDRS) 310-20-39 Advanced Space Systems for Users of NASA Network 310 20-46 Operations Support Computing Technology 310-40-26 Human-to-Machine Interface Technology 310-40-37 TEA LASERS Tropospheric Wind Measurement Assessment 146-72-04 TECHNOLOGY ASSESSMENT Advanced Radiant Energy Conversion 506-55-13 Advanced Radiant Energy Conversion 506-55-76 Advanced Large Spacecraft Systems Analysis 506-62-23 Technology Requirements for Advanced Space Transport Systems 506-63-23 Technology Systems Analysis Across 506-64-13 Space Communications Systems Antenna Technology 650-60-20 Advanced Communications Technology Satellite (Al System Studies 550-60-26 TECHNOLOGY TRANSFER Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHNOLOGY UTILIZATION Commercial Materials Processing in Low-Gravity 179-60-62 Applications Experiments Program Support 646-41-02 TECHONICS Planetary Petrology	Space Station Life Support Technology

TERMINAL BALLISTICS	THERMAL MAPPING	TIME
Experimental Impact Cratering 153-08-40 W83-70304	Improved Rock Type Discrimination 677-41-03 W83-70529	X-Ray Astronomy 188-46-59 W83-70388
TERRESTRIAL PLANETS	High Spectral Resolution Techniques for Geologic Mapping	TIME DIVISION MULTIPLE ACCESS
Planetary Geology 151-01-70 W83-70292	677-41-14 W83-70531 THERMAL PROTECTION	Satellite Communication Technology 310-20-38 W83-70561
TEST CHAMBERS Aircraft loing Research	Thermo-Gasdynamic Test Complex	TIME MEASUREMENT Precision Time and Frequency Sources
505-45-02 W83-70084	506-51-41 W83-70126 Thermal Protection Systems Materials and Systems	310-10-42 W83-70556
TEST FACILITIES AIRLAB Operations	Evaluation	Frequency and Timing Research 310-10-62 W83-70558
505-34-23 W83-70035 Interagency Assistance and Testing - Dryden	506-53-31 W83-70136 Thermal Protection Systems for Earth-To-Orbit STS	TIME SIGNALS Shuttle Time and Frequency Transfer Experiment (STIFT)
505-43-31 W83-70074	506-53-33 W83-70137	676-59-41 W83-70512
Interagency & Industrial Assistance & Testing 505-43-32 W83-70075	Advanced Carbon-Carbon Panels 506-53-37 W83-70138	Precision Time and Frequency Sources 310-10-42 W83-70556
Thermo-Gasdynamic Test Complex 506-51-41 W83-70126	Shuttle Infrared Leeside Temperature Sensing (SILTS) 506-63-34 W83-70221	Frequency and Timing Research 310-10-62 W83-70558
Communications Laboratory for Transponder Development	OEX Thermal Protection Experiments	TIROS N SERIES SATELLITES
and Satellite Network Evaluation 650-60-23 W83-70477	506-63-36 W83-70223 THERMAL RESISTANCE	Ocean Advanced Studies 161-10-00 W83-70332
TETHERED SATELLITES Tethered Satellite System (TSS) (System Development)	High Temperature Engine Composites	Cloud Properties from Satellite Radiances 672-20-09 W83-70492
906-70-00 W83-70590	505-33-32 W83-70024 THERMAL SHOCK	TISSUES (BIOLOGY)
Advanced Concepts 906-80-00 W83-70593	Experimental Magnetism 153-08-50 W83-70305	Sample Bank 199-70-32 W83-70449
TETHERING Advanced Concepts	THERMAL STRESSES	TITAN Planetary Clouds Particulates and Ices
906-80-00 W83-70593	Life Prediction for Engine Materials 505-33-22 W83-70021	154-30-80 W83-70311
TETHERLINES Advanced Concepts	Structures Analysis and Synthesis 506-53-51 W83-70142	Atomic and Molecular Properties of Planetary Atmospheric Constituents
906-80-00 W83-70593 TEXTURES	THERMISTORS	154-50-80 W83-70313 TITANIUM
Planetary Petrology	Correlative Measurement Improvements 673-18-00 W83-70502	Planetary Aeronomy Theory and Analysis
153-02-40 W83-70299 Thematic Mapper Simulator Land Resources Studies in	THERMOCHEMISTRY Aviation Safety Technology - Applied Fluid Mechanics/Fire	154-60-80 W83-70314 TITANIUM ALLOYS
Western Ecozones 677-21-26 W83-70515	Materials Modeling	Advanced Low Thrust Chemical Propulsion Technology 506-60-25 W83-70209
New Techniques for Quantitative Analysis of SAR Images	505-45-15 W83-70089 THERMODYNAMIC EQUILIBRIUM	TOPEX
677-46-02 W83-70543 Use of Thematic Mapper Data for Electrical Utility	JPL Petrology Support 153-02-70 W83-70300	Research Mission Study - TOPEX 161-10-01 W83-70333
Transmission Corridor Analysis and Siting 677-60-19 W83-70549	THERMODYNAMIC PROPERTIES	Advanced Earth Orbiter Radio Metric Technology Development
THEMATIC MAPPING	Burning Fundamentals & Heat Transfer 505-31-42 W83-70012	161-10-03 W83-70334
Monitoring Large Scale Total Primary Production and Desertification Processes with AVHRR Imagery	THERMODYNAMICS Formation Evolution and Stability of Proto-Stellar Disks	TOPOGRAPHY Planetary Geology
199-30-07 W83-70429 Renewable Resources Field Research and Spacecraft Data	153-01-60 W83-70298 THERMOELECTRIC GENERATORS	151-01-70 W83-70292 Advanced Earth Orbiter Radio Metric Technology
Analysis	Thermal to Electric Energy Conversion Technology	Development 161-10-03 W83-70334
Land Cover Multisensor Analysis	506-55-65 W83-70177 THERMOELECTRIC MATERIALS	Physical Oceanography
677-21-25 W83-70514 Thematic Mapper Simulator Land Resources Studies in	Multidisciplinary Research 506-56-20 W83-70184	161-20-00 W83-70335 Altimeter Time-Dependent Current Studies
Western Ecozones 677-21-26 W83-70515	THERMOELECTRIC POWER GENERATION	161-20-07 W83-70336 Polar Oceanography
Multisensor Technique Development	Thermal to Electric Energy Conversion Technology 506-55-65 W83-70177	161-40-00 W83-70342
677-21-28 W83-70516 Land Resources Applied Research	Space Energy Conversion Support 506-55-70 W83-70178	Lithospheric Structure and Evolution 676-30-05 W83-70507
677-21-29 W83-70517 Hydrologic Information Extraction Technique Development	THERMOMECHANICAL TREATMENT Advanced Structural Alloys	Digital Topographic Mapping Mission Requirements/Feasibility Study
677-22-27 W83-70519 Improved Rock Type Discrimination	505-33-13 W83-70019	677-29-12 W83-70522 Digital Topographic Mapping Mission
677-41-03 W83-70529	THERMOPLASTIC RESINS Fundamentals of Mechanical Behavior of Composite	Requirements/Feasibility Study
Hydrothermal Ore System Detection in Partially Vegetated Mountainous Terrain	Matrices 506-53-15 W83-70129	677-29-12 W83-70523 Topographic Mapping Methods
677-41-13 W83-70530 Oil and Gas Test Case Study	THERMOREGULATION General biomedical Research	677-43-17 W83-70540 Spatial Radar Image Registration
677-41-16 W83-70532	199-20-92 W83-70428	677-48-03 W83-70546 TOWED BODIES
Chromite Test Case Study 677-41-17 W83-70533	Advanced Extravehicular Systems (Space Suit) 199-60-21 W83-70442	Lidar and Acoustics Applications to Ocean Productivity
Use of TM for the Detection of Mineralization in Vegetated Terrain Through Inference of Geobotanical Parameters	Advanced Extravehicular Systems 199-60-22 W83-70443	161-30-05 W83-70341 TOXICITY
677-42-04 W83-70536 Remote Sensing Techniques for Geobotanical Discrimination	THERMOSETTING RESINS	Aircraft Fire Safety Materials Testing 505-45-17 W83-70090
of Chromium-Bearing Rock Types	Fundamentals of Mechanical Behavior of Composite Matrices	TRACE CONTAMINANTS
677-42-05 W83-70537 Geobotanical Mapping in the Eastern United States	506-53-15 W83-70129 THIN FILMS	Global Tropospheric Modeling of Trace Gas Distribution 176-10-00 W83-70350
677-42-07 W83-70538 New Techniques for Quantitative Analysis of SAR Images	Development of Experiment and Hardware	Development of Resonant Ionization Laser Spectroscopy for Tropospheric NOx Measurements
677-46-02 W83-70543	188-38-51 W83-70371 THREE DIMENSIONAL FLOW	176-40-03 W83-70352
Digital Mapping of Irrigated Cropland 677-60-11 W83-70547	Numerical Aerodynamic Computational Techniques 505-37-01 W83-70049	TRACKING (POSITION) Flight Experiments Support
Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment	Computational and Experimental Aerotherodynamics 506-51-11 W83-70123	532-07-11 W83-70099 Space Station Communication Technology
677-60-15 W83-70548	THROATS	506-58-27 W83-70204
Use of Thematic Mapper Data for Electrical Utility Transmission Corridor Analysis and Siting	Reusable High Pressure Main Engine Technology 506-60-19 W83-70208	TRACKING STATIONS Systems Management Technology
677-60-19 W83-70549 THERAPY	THROTTLING Variable Thrust OTV Propulsion Technology	310-40-49 W83-70575 TRACTION
Crew Health Maintenance	506-60-42 W83-70210	Aircraft Landing Dynamics
199-10-31 W83-70409 THERMAL CONDUCTORS	THRUST AUGMENTATION Geodynamics/Flight Dynamics of Powered Lift Vehicles	505-45-23 W83-70092 TRADEOFFS
Power Systems Management and Distribution 506-55-72 W83-70179	505-43-01 W83-70068 THRUST REVERSAL	Advanced Turboprop-Installation Aerodynamics 535-03-11 W83-70121
THERMAL CONTROL COATINGS	Non-Axisymmetric Nozzle Research	Space Station Communication Technology
Composites for Advanced Space Systems 506-53-23 W83-70131	505-43-22 W83-70072 THRUST VECTOR CONTROL	506-58-27 W83-70204 Space Operations Study Follow on
Electrically Conductive Thermal Control Coatings	Powered Lift Propulsion Technology 505-43-02 W83-70069	906-64-20 W83-70584
506-53-26 W83-70133 Space Durable Composites and Thermal Control Surfaces	Non-Axisymmetric Nozzle Research	TRAJECTORIES Giotto Ion Mass Spectrometer Co-Investigator Support
506-53-29 W83-70135 Thermal Protection Systems for Earth-To-Orbit STS	TIDAL FLATS	156-03-03 W83-70321 TRAJECTORY ANALYSIS
506-53-33 W83-70137	Biosphere-Atmosphere Interactions in Wetland Ecosystems 199-30-36 W83-70431	Very Long Baseline Interferometry (VLBI) Tracking of the
THERMAL ENVIRONMENTS Dynamic Acoustic and Thermal Environments (DATE)	TIDES Physical Oceanography	Tracking and Data Relay Satellite (TDRS) 310-20-39 W83-70562
Experiment (Transportation Technology VerificationOEX Program)	161-20-00 W83-70335	TRAJECTORY OPTIMIZATION Automation Systems Research
506-63-39 W83-70225	TILES Computational and Experimental Aerotherodynamics	506-54-63 W83-70161
THERMAL INSULATION Thermal to Electric Energy Conversion Technology	506-51-11 W83-70123 OEX Thermal Protection Experiments	TRANSDUCERS Controls and Instrumentation
506-55-65 W83-70177	506-63:36 ~ ~ ~ W83-70223	-505-40-52

TRANSFER FUNCTIONS		TRUSSES		TWO PHASE FLOW	
Climate Observations 672-40-00	W83-70494	Advanced Space Structures 506-53-43	W83-70140	Platform Systems Operations 506-64-22	W83-70233
TRANSIENT RESPONSE Data Analysis		Structural Assembly Demonstration Exper 906-55-00	ment (SADE) W83-70580		
385-38-01	W83-70459	TUNABLE LASERS Acytive and Passive Sensor Research		U	
TRANSLATIONAL MOTION OEX-Advanced Autopilot		506-54-25	W83-70155	W.T.A.W.O.V. F.D.F.O.V.C.V.C.F.O.	
506-63-42 TRANSMISSIONS (MACHINE ELEMENTS)	W83-70227	Stratospheric Research Balloon Laser In-Situ 147-11-04	W83-70267	ULTRAHIGH FREQUENCIES Airborne Radar Operations	
Power Transfer Research		Atomic and Molecular Properties of Planetary Constituents	Atmospheric	677-47-03 ULTRASONIC FLAW DETECTION	W83-70544
505-40-42 Rotorcraft-Operating Problems	W83-70059	154-50-80	W83-70313	Life Prediction for Structural Materials	
505-42-32	W83-70066	Cosmic Chemistry Aeronomy Comets Grains 154-75-80	W83-70315	505-33-23 ULTRAVIOLET ASTRONOMY	W83-70022
Convertible Engine System Technology 532-06-12	W83-70097	Development of Resonant Ionization Laser Spi Tropospheric NOx Measurements	ectroscopy for	UV and Optical Astronomy	W00 20200
Rotorcraft Vibration and Noise		176-40-03	W83-70352	188-41-51 Sounding Rockets Experiments (Astronomy)	W83-70380
532-06-13 TRANSMITTER RECEIVERS	W83-70098	TUNNEL DIODES Acousto-Optic & Submillimeter Device Techno	ology	879-11-41 ULTRAVIOLET LASERS	W83-70552
Mobile Satellite Experiment 650-60-00	W83-70473	506-54-16 Turbine Blades	W83-70151	Electronics Research and Technology	W00 70150
TRANSONIC FLIGHT	W63-70473	Turbine Engine Hot Section Technology (HOS		506-54-15 Acytive and Passive Sensor Research	W83-70150
Loads and Aeroelasticity 505-33-43	W83-70028	533-04-12 TURBINE ENGINES	W83-70115	506-54-25 Development of Resonant Ionization Laser Sp	W83-70155 ectroscopy for
F-4C Spanwise Blowing Flight Investigations 533-02-31		Non-Axisymmetric Nozzle Research 505-43-22	W83-70072	Tropospheric NOx Measurements 176-40-03	
Highly Maneuverable Aircraft Technology	Flight Research	TURBINES		ULTRAVIOLET PHOTOMETRY	W83-70352
533-03-11 TRANSONIC FLOW	W83-70114	Computational Fluid Dynamics for Turbornach 505-31-02	W83-70002	In-Situ Measurements of Stratospheric Ozone 147-11-05	W83-70268
Computational Methods and Application Dynamics	ons in Fluid	Reusable High Pressure Main Engine Technolo 506-60-19	ogy W83-70208	ULTRAVIOLET RADIATION Effects of Space Environment on Composites	
505-31-01	W83-70001	TURBOCOMPRESSORS		506-53-25	W83-70132
Computational and Analytical Fluid Dynamic 505-31-03	s W83-70003	Computational Fluid Dynamics for Turbomach 505-31-02	mery W83-70002	Absolute Solar Flux and Variability 673-15-00	W83-70501
TRANSONIC SPEED Flight Loads Analysis		Fan and Compressor Research 505-40-12	W83-70056	Variability and Trends in Stratospheric Ozon Atmosphere and UV Solar Flux Variations	
505-33-41	W83-70026	TURBOFAN ENGINES	***************************************	673-41-00	W83-70504
TRANSONIC WIND TUNNELS Experimental Test Techniques		Engine Dynamics and Aeroelasticity 505-33-42	W83-70027	ULTRAVIOLET SPECTRA Upper Atmosphere Research - Laboratory	Measurements
505-31-53 High-Speed Wind Tunnel Operations	W83-70015	Energy Efficient Engine Project 535-01-12	W83-70120	147-23-00	W83-70280
505-43-61	W83-70079	TURBOFANS		Spectrometer	
TRANSPONDERS Communications Laboratory for Transponde	r Development	Computational Fluid Dynamics for Turbomach 505-31-02	mery WB3-70002	673-13 00 ULTRAVIOLET SPECTROMETERS	W83-70499
and Satellite Network Evaluation 650-60-23	W83-70477	Fan and Compressor Research 505-40-12	W83-70056	Critical Examination of Upper Stratospheric 147-43-00	Measurements W83-70288
Satellite Communication Technology		TURBOJET ENGINE CONTROL	***************************************	Spectroscopic Properties of the Stratosphere	
310-20-38 TRANSPORT AIRCRAFT	W83-70561	Controls and Instrumentation 505-40 52	W83-70060	147-44-00 ULTRAVIOLET SPECTROPHOTOMETERS	W83-70289
Advanced Structural Analysis Methods 505-33-53	W83-70029	Advanced Fighter Aircraft (F-15) 533-02-21	W83-70102		Profile and
Aircraft Icing Research		Integrated Research Aircraft Control	Technology	673-11-00	W83-70498
505-45-02 Aerodynamics/Propulsion Integration	W83-70084	(INTERACT) 533-02-41	W83-70105	UNDERWATER ACOUSTICS Lidar and Acoustics Applications to Ocea	an Productivity
505-45-43	W83-70093	Highly Maneuverable Aircraft Technology Fi 533-03-11	light Research W83-70114	161-30 05	W83-70341
Structural Integration 534-03-13	W83-70116	TURBOJET ENGINES	VV33-70114	UNITED STATES OF AMERICA Digital Mapping of Irrigated Cropland	
Advanced Turboprop-Installation Aerodynam 535-03-11	ics W83-70121	Power Transfer Research 505-40-42	W83-70059	677-60 11 UNIVERSE	W83-70547
TRANSPORT PROPERTIES Cross Section Determination Cosmic		Advanced Fighter Aircraft (F-15) 533-02-21	W83-70102	Life in the Universe	W83-70438
Background Determination Neutron Transport		TURBOMACHINERY	***************************************	199-50 52 The Search for Extraterrestrial Intelligence	
Planetary Evaluation and Dynamic Studies 153-03-50	W83-70301	Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-70009	199-50 62 UNIVERSITY PROGRAM	W83-70439
Solar and Heliospheric Physics Data Analyse 385-38-01	s W83-70461	Earth-to-Orbit Propulsion Life and Performand 506-60-12	ce Technology W83-70206	Fund for Independent Research (Aeronautics)	W83-70044
TRAVELING WAVE MASERS	VV63-70401	Variable Thrust OTV Propulsion Technology		505-36 13 Aeronautics Graduate Research Program	
Station Monitor and Control Technology 310-20-68	W83-70568	506-60-42 TURBOPROP AIRCRAFT	W83-70210	505-36-21 Graduate Program in Aeronautics	W83-70045
TRAVELING WAVE TUBES Satellite Communications Research and Tech	nology	Propeller Research 505-40-32	W83-70058	505-36-22	W83-70046
506-58-22	W83-70200	Advanced Turboprop-Installation Aerodynamic	s	Graduate Program in Aeronautics 505-36-23	W83-70047
TRIBOLOGY High Temperature Materials		535-03-11 TURBOPROP ENGINES	W83-70121	JIAFs Base Support 505-36-43	W83-70048
505-33-12 Non-Destructive Evaluation and Tribology	W83-70018	Power Transfer Research 505-40-42	W83-70059	Aerospace Computer Science University Rese	
506-53-12	W83-70128	Advanced Turboprop-Installation Aerodynamic	s	505-37-20 Space Computer Science University Research	
Tribological Experiments in Zero Gravity 542-03-27	W83-70245	535-03-11 Advanced Turboprop Program	W83-70121	506-54-50 UNSTEADY FLOW	W83-70158
TROPICAL METEOROLOGY Severe Storms and Local Weather Research		535-03-12 TURBORAMJET ENGINES	W83-70122	Computational Fluid Dynamics for Turbomach 505-31-02	w83-70002
175-13-00	W83-70346	High Speed (Super/Hypersonic) Technology		UP-CONVERTERS	***************************************
TROPOPAUSE Clear Air Turbulence Studies Using Passin	re Microwave	505-43-83 Turbulence	W83-70082	Radio Systems Development 310-20-66	W83-70566
Radiometers 505-45-05	W83-70086	Aeroacoustics Research 505-31-33	W83-70010	UPGRADING Human Factors Facilities Operations	
TROPOSPHERE		Computational and Experimental Aerotherodyn	namics	505-35-01	W83-70036
Tropospheric Air Quality - Technology Develor 146-20-10	pment W83-70250	506-51-11 TURBULENT BOUNDARY LAYER	W83-70123	UPLINKING Automation Technology for Planning Tele	operation and
Tropospheric Wind Measurement Assessmen 146-72-04	w83-70260	Viscous Flows 505-31-11	W83-70004	Robotics 506-54-65	W83-70162
Atmospheric Processes Experiments and Sys	stems	Viscous Drag Reduction and Control		Communications Laboratory for Transponder	
147-10-03 Stratospheric Research	W83-70265	505-31-13 Boundary-Layer Stability and Transition Resea	W83-70005 rch	and Satellite Network Evaluation 650-60-23	W83-70477
147-30-02 General Circulation Modeling of the Stratosp	W83-70284	505-31-15 TURBULENT FLOW	W83-70006	X-Band Uplink Development 310-20-64	W83-70564
147-32-00	W83-70286	Computational Methods and Application	s in Fluid	UPPER ATMOSPHERE	
Głobał Tropospheric Models 176-10-00	W83-70349	Dynamics 505-31-01	W83-70001	Shuttle Upper Atmosphere Mass Spectron 506-63-37	meter (SUMS) W83-70224
Global Tropospheric Modeling of Trace G 176-10-00		Viscous Flows 505-31-11	W83-70004	Upper Atmosphere Research - Field Measurer	
Kinetic Studies Involving CH302 HO2 and		Viscous Drag Reduction and Control		147-11-00 Upper Atmosphere Research - Field Measurer	ments
Tropospheric Importance 176-30-01	W83-70351	505-31-13 Boundary-Layer Stability and Transition Resea		147-12-00 Stratospheric Fourier Spectroscopy at Near	W83-70269 and Mid IR
Development of Resonant Ionization Laser Space Tropospheric NOx Measurements		505-31-15 Experimental/Theoretical Aerodynamics	W83-70006	Wavelengths	W83-70270
176-40-03	W83-70352	505-31-21	W83-70007	147-12-05 Stratospheric Research Field Measureme	
Biosphere-Atmosphere Interactions in Wetla 199-30-36	nd Ecosystems W83-70431	Test Methods and Instrumentation 505-31-51	W83-70013	Millimeter and Submillimeter Radiometry 147-12-06	W83-70271
Aircraft Borne LIDAR for O3 and OH Measus 673-14-00		Thermo-Gasdynamic Test Complex 506-51-41		Pressure Modulator Radiometer	
0/3-14-00	***************************************	300-31-41	W83-70126	147-12-08	W83-70272

UPWELLING WATER SUBJECT INDEX

Solar Flux in Upper Atmosphere		Hydrothermal Ore System Detection in Part	tially Vegetated	VIDEO DISKS	
147-15-00	W83-70273	Mountainous Terrain	W83-70530	Archival Mass Memory 506-58-10	W83-70194
Multi-Sensor Balloon Measurements 147-16-01	W83-70274	677-41-13 Chromite Test Case Study	W63-70530	VIKING MARS PROGRAM	W63-70194
Upper Atmosphere Research - Re Measurements	eaction Rate	677-41-17	W83-70533	Planetary Data Network Project 656-80-01	W83-70489
147-21-00 Chemical Kinetics of the Upper Atmosphere	W83-70277	SMIRR Data Analysis 677-41-19	W83-70534	VISCOELASTICITY Fundamentals of Mechanical Behavior	of Composite
147-21-03	W83-70278	Use of TM for the Detection of Mineralization Terrain Through Inference of Geobotanical Par		Matrices	
Photochemistry of the Upper Atmosphere 147-22-01	W83-70279	677-42-04	W83-70536	506-53-15 VISCOPLASTICITY	W83-70129
Upper Atmosphere Research - Laboratory	Measurements	Remote Sensing Techniques for Geobotanica of Chromium-Bearing Rock Types	al Discrimination	Life Prediction for Engine Materials	W83-70021
147-23-00 Infrared Laboratory Spectroscopy in Support of	W83-70280 of Stratospheric	677-42-05	W83-70537	505-33-22 VISCOUS FLOW	W63-70021
Measurements 147-23-08	W83-70281	Geobotanical Mapping in the Eastern United 677-42-07	1 States W83-70538	Viscous Flows 505-31-11	W83-70004
Laser Laboratory Spectroscopy		VEGETATION GROWTH	6- 051.00	Numerical Aerodynamic Computational Tec	
147-23-09 Millimeter/Submillimeter Laboratory Spectros		Food Requirements Production and Proces 199-60-42	W83-70444	505-37-01 VISIBLE SPECTRUM	W83-70049
147-23-10 Upper Atmosphere Research - Theoretical St	W83-70283	VENTILATION Aviation Safety Technology - Applied Fluid	Machanice / Eiro	Meteorological Observing System Develops 146-70-00	ment W83-70256
147-31-00	W83-70285	Materials Modeling		Climate Observations	
General Circulation Modeling of the Stratospi 147-32-00	here W83-70286	505-45-15 VENUS (PLANET)	W83-70089	672-40-00 Improved Rock Type Discrimination	W83-70494
Critical Examination of Upper Stratospheric 147-43-00	Measurements W83-70288	Planetary Clouds Particulates and Ices		677-41-03 High Spectral Resolution Techniques for G	W83-70529
UPWELLING WATER	***************************************	154-30-80 Planetary Aeronomy Theory and Analysis	W83-70311	677-41-14	W83-70531
Ocean Optics 161-30-00	W83-70339	154-60-80	W83-70314	VISION Space Motion Sickness	
URANUS (PLANET)		High-Speed Signal Processing Research 310-30-70	W83-70570	199-20-21	W83-70414
Planetary Infrared Imaging 196-41-77	W83-70403	VENUS ATMOSPHERE		Basic Mechanisms Underlying Space Motion 199-20-22	W83-70415
URBAN RESEARCH Land Cover Multisensor Analysis		Dynamics of Planetary Atmospheres 154-20-80	W83-70309	VOCODERS Satellite Communication Technology	
677-21-25	W83-70514	Extended Atmospheres		310-20-38	W83-70561
USER REQUIREMENTS Communications Satellite New Application	n Notification	154-80-80 Extended Atmospheres	W83-70316	VORTICES Viscous Drag Reduction and Control	
Studies		154-80-80	W83-70317	505-31-13	W83-70005
643-10-02 Experiment Coordination and Mission Suppor	W83-70469	VEGA Balloon Nephelometer Design 157-04-80	W83-70327	Experimental/Theoretical Aerodynamics 505-31-21	W83-70007
646-41-01	W83-70471	VENUS CLOUDS		Experimental/Applied Aerodynamics 505-31-23	W83-70008
Applications Experiments Program Support 646-41-02	W83-70472	VEGA Balloon Nephelometer Design 157-04-80	W83-70327	F-4 Spanwise Blowing	
Oceanic Pilot System 656-13-40	W83-70479	VENUS SURFACE Planetary Geology		533-02-33 VOYAGER PROJECT	W83-70104
Atmospheres and Climate Data Management		151-01-70	W83-70292	Planetary Atmospheric Composition Struc	
656-26-02 Digital Image Recovery and Data Manageme	W83-70480 nt	VERTEBRATES Biological Adaptation		154-10-80 Remote Sensing of Atmospheric Structure	W83-70308
656-31-02	W83-70482	199-40-32	W83-70433	154-40-80 Planetary Infrared Imaging	W83-70312
Human-to-Machine Interface Technology 310-40-37	W83-70572	VERTICAL MOTION SIMULATORS Simulation Facilities Operations		196-41-77	W83-70403
Geostationary Platform Bus Definition 906-90-03	W83-70595	532-08-11 VERY LARGE SCALE INTEGRATION	W83-70100	Planetary Data Network Project 656-80-01	W83-70489
333 55 55		Data Systems Research and Technology		333 33 31	
V		506-58-13 Network Software Design Technology	W83-70196	w	
•		Network Software Design Technology 310-40-72	W83-70196 W83-70576		
V/STOL AIRCRAFT		Network Software Design Technology	W83-70576	WARNING SYSTEMS	
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 50S-42-81	W83-70067	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03	W83-70576 W83-70330	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03	W83-70085
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations		Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30	W83-70576 W83-70330	WARNING SYSTEMS Aviation Safety Severe Storm Hazards	
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology	Lift Vehicles W83-70068	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources	W83-70576 W83-70330 Earth Surveying W83-70510	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31	W83-70239
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Ausymmetric Nozzle Research	Lift Vehicles W83-70068 W83-70069	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37	W83-70239 nent W83-70240
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-25	Ust Vehicles W83-70068 W83-70069 W83-70072	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developr	W83-70239 nent W83-70240
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Aussymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50	d Lift Vehicles W83-70068 W83-70069 W83-70072 periments W83-70106	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-54-31 Life Support Systems Technology Developr 506-64-37 Remote Sensing Applications for Facility Si	W83-70239 nent W83-70240
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program	d Lift Vehicles W83-70068 W83-70069 W83-70072 Deriments W83-70106 Flight Research	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS)	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develope 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology	W83-70239 nent W83-70240 ite Selection and W83-70548
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51	d Lift Vehicles W83-70068 W83-70069 W83-70072 periments W83-70106	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI)	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developr 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31	W83-70239 nent W83-70240 ite Selection and
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati	d Lift Vehicles W83-70068 W83-70069 W83-70072 Deriments W83-70106 Clight Research W83-70107	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11	W83-70239 nent W83-70240 ite Selection and W83-70548
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION	d Lift Vehicles W83-70068 W83-70069 W83-70072 Deriments W83-70106 Flight Research W83-70107	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developr 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems	W83-70239 nent W83-70240 te Selection and W83-70548 W83-70239
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51	d Lift Vehicles W83-70068 W83-70069 W83-70072 Deriments W83-70106 Clight Research W83-70107	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION	W83-70239 ment W83-70240 ite Selection and W83-70548 W83-70239 W83-70440 W83-70441
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology	d Lift Vehicles W83-70068 W83-70069 W83-70072 elight Research W83-70106 Right Research W83-70107 Ings W83-70133	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) 17acking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRFI)/Variable Gracility (VGRFI)	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 To Sickness W83-70415 Gravity Research	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develop 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42	W83-70239 ment W83-70240 ite Selection and W83-70548 W83-70239 W83-70440 W83-70441
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Costi 506-53-26 Development of Experiment and Hardware 188-38-11 VALVES Programmable Mask Technology 506-54-17	d Lift Vehicles W83-70069 W83-70072 Derriments W83-70106 light Research W83-70107	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable G	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developr 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS	d Lift Vehicles W83-70068 W83-70069 W83-70072 W83-70106 Right Research W83-70107 ngs W83-70133 W83-70133 W83-70152	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) 17acking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Geacility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 To Sickness W83-70415 Travity Research W83-70451	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic	W83-70239 ment W83-70240 ite Selection and W83-70239 W83-70244 W83-70441 essing for CELSS W83-70444
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION	d Lift Vehicles W83-70068 W83-70069 W83-70072 Seriments W83-70106 (light Research W83-70107 mgs W83-70133 W83-70371 W83-70152	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) 17acking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 To Sickness W83-70415 Gravity Research W83-70451 W83-70026	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develope 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52	W83-70239 ment W83-70240 ite Selection and W83-70239 W83-70244 W83-70441 essing for CELSS W83-70444
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes	d Lift Vehicles W83-70069 W83-70069 W83-70079 W83-70106 Clight Research W83-70107 mgs W83-70133 W83-70371 W83-70152 CT) W83-70115	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 Sickness W83-70415 Gravity Research W83-70451 W83-70451 W83-70026	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 505-54-17 VANKES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 173-80-70 VAPOR PHASE EPITAXY	d Lift Vehicles W83-70068 W83-70069 W83-70072 W83-70106 Right Research W83-70107 ngs W83-70133 W83-70133 W83-70152	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42 11	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 Sickness W83-70415 Gravity Research W83-70451 W83-70451 W83-70026	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VYPOR PHASE EPITAXY Solar Cell Research	d Lift Vehicles W83-70068 W83-70069 W83-70072 berriments W83-70106 light Research W83-70107 mgs W83-70133 W83-70371 W83-70152 ST) W83-70115 W83-70368	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-62 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Gracility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 1 Sickness W83-70415 Sravity Research W83-70451 W83-70026 W83-70028	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Supp 542-03-14 WATER CIRCULATION	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPOR IZING	d Lift Vehicles W83-70069 W83-70069 W83-70079 W83-70106 Clight Research W83-70107 mgs W83-70133 W83-70371 W83-70152 CST) W83-70368 W83-70368	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-23 Rotorcraft Systems Integration	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 a Sickness W83-70415 biravity Research W83-70451 W83-70026 W83-70028 W83-70028	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Supp 542-03-14	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANRS Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43	d Lift Vehicles W83-70069 W83-70069 W83-70079 W83-70106 Clight Research W83-70107 mgs W83-70133 W83-70371 W83-70152 CST) W83-70368 W83-70368	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Rotocraft Aeromechanics and Configuration 505-42-23 Rotocraft Systems Integration 532-06-11 Rotocraft Systems Integration 532-06-11 Rotocraft Vibration and Noise	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70559 Tracking of the W83-70562 W83-70414 Sickness W83-70415 Gravity Research W83-70451 W83-70026 W83-70028 W83-70028 W83-70065 W83-70096	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 508-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION FOOD Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Supp 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain 154-75-80 VARIABILITY	d Lift Vehicles W83-70068 W83-70069 W83-70072 Seriments W83-70106 (light Research W83-70107 mgs W83-70133 W83-70152 ST) W83-7015 W83-70168 W83-70368 W83-70171 s	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Gracility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configuration 505-42-23 Rotocraft Systems Integration 532-06-11 Rotocraft Vibration and Noise 532-06-11	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70562 W83-70414 a Sickness W83-70415 biravity Research W83-70451 W83-70026 W83-70028 W83-70028	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Supp 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPOR IZING Cosmic Chemistry Aeronomy Comets Graint 154-75-80 VARIABILITY X-Ray Astronomy 188-46-59	d Lift Vehicles W83-70068 W83-70069 W83-70072 Seriments W83-70106 (light Research W83-70107 mgs W83-70133 W83-70152 ST) W83-7015 W83-70168 W83-70368 W83-70171 s	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configuration 505-42-23 Rotocraft Systems Integration 532-06-11 Rotocraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Evaluation 533-02-71	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70559 Tracking of the W83-70562 W83-70414 Sickness W83-70415 Gravity Research W83-70451 W83-70026 W83-70028 SS W83-70065 W83-70065 W83-70096	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develope 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION FOOD Requirements Production and Proce 199-60-52 Systems Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 50-0-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WASTE RECLAMATION	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain 154-75-80 VARIABILITY X-Ray Astronomy	d Lift Vehicles W83-70068 W83-70069 W83-70072 Desirable W83-70106 Period Properties W83-70107 M83-70107 M83-70152 M83-70115 W83-70168 W83-70171 S W83-70315	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-11 Rotorcraft Systems Integration 532-06-11 Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70559 Tracking of the W83-70562 W83-70414 1 Sickness W83-70415 Gravity Research W83-70451 W83-70026 W83-70028 W83-70064 W83-70065 W83-70096 W83-70098	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANNES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain: 154-75-80 VARIABILITY X-Ray Astronomy 188-46-59 VARIABLE THRUST Vanable Thrust OTV Propulsion Technology 506-60-42	d Lift Vehicles W83-70068 W83-70069 W83-70072 Desirable W83-70106 Period Properties W83-70107 M83-70107 M83-70152 M83-70115 W83-70168 W83-70171 S W83-70315	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestubular Research Facility (VRF)/Variable Gracility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-23 Rotorcraft Systems Integration 532-06-11 Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Spacecraft Controls and Guidance	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70414 To Sickness W83-70415 Stravity Research W83-70451 W83-70026 W83-70028 W83-70064 W83-70065 W83-70096 W83-70098 W83-70109 W83-70110	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Developt 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 50-0-62 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 505-54-17 VANKES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 178-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPOR ISING Cosmic Chemistry Aeronomy Cornets Grain: 154-75-80 VARIABILITY X-Ray Astronomy 188-46-59 VARIABLE THRUST Variable Thrust OTV Propulsion Technology	d Lift Vehicles W83-70068 W83-70069 W83-70072 Desirtments W83-70106 Elight Research W83-70107 Desirtments W83-70107 Desirtments W83-70115 W83-70115 W83-70115 W83-70368 W83-70315 W83-70388 W83-70388 W83-70210	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Gracility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotocreaft Aeromechanics and Configuration 505-42-23 Rotocreaft Systems Integration 532-06-11 Rotocreaft Systems Integration 532-06-11 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 503-20-73 Spacecraft Controls and Guidance 506-57-13 VIBRATION ISOLATORS	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70414 1 Sickness W83-70415 Sickness W83-70415 W83-70451 W83-70026 W83-70028 ISS W83-70064 W83-70065 W83-70096 W83-70098 W83-70109	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develope 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-52 Systems Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support Systems 199-10-12 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANKS Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain: 154-75-80 VARIABILITY XRay Astronomy 188-46-59 VARIABLE THRUST Variable Thrust OTV Propulsion Technology 506-60-42 VARIABLE THRUST Solar and Hehospheric Physics Data Analyses 385-38-01	d Lift Vehicles W83-70068 W83-70069 W83-70072 Desirtments W83-70106 Elight Research W83-70107 Desirtments W83-70107 Desirtments W83-70115 W83-70115 W83-70115 W83-70368 W83-70315 W83-70388 W83-70388 W83-70210	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-23 Rotorcraft Systems Integration 532-06-11 Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Spacecraft Controls and Guidance 506-57-13	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70414 To Sickness W83-70415 Stravity Research W83-70451 W83-70026 W83-70028 W83-70064 W83-70065 W83-70096 W83-70098 W83-70109 W83-70110	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 Waste Management Froduction and Proce 199-60-62 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Supp 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANKS Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain: 154-75-80 VARIABILITY XRay Astronomy 188-46-59 VARIABLE THRUST Variable Thrust OTV Propulsion Technology 506-60-42 VARIABLE THRUST Solar and Hehospheric Physics Data Analyses 385-38-01	d Lift Vehicles W83-70068 W83-70068 W83-70069 W83-70106 Period Control of the Con	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestubular Research Facility (VRF)/Variable Gracility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-11 Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Spacecraft Controls and Guidance 506-57-13 VIBRATION ISOLATORS Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-73 VIBRATION ISOLATORS Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Evaluation	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70414 To Sickness W83-70415 Stravity Research W83-70451 W83-70026 W83-70028 W83-70064 W83-70065 W83-70098 W83-70109 W83-70110 W83-70185	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WATER VAPOR Meteorological Lidar Development	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain 154-75-80 VARIABILITY X. Ray Astronomy 188-46-59 VARIABLE THRUST Vanable Thrust OTV Propulsion Technology 506-60-42 VARIANCE (STATISTICS) Solar and Heliospheric Physics Data Analyses 385-38-00 FILE Flight ExperimentsAnalysis and Suppor	d Lift Vehicles W83-70068 W83-70069 W83-70072 Seriments W83-70106 Seriments W83-70107 M83-70107 M83-70152 ST) W83-70155 W83-70155 W83-70368 W83-70315 W83-70388 W83-70210 Seriments W83-70210 Seriments W83-70210 Seriments W83-70243	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable Clacility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-11 Rotorcraft Systems Integration 532-06-11 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Spacecraft Controls and Guidance 506-57-13 VIBRATION ISOLATORS Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Evaluation 533-02-71	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70562 W83-70414 Sickness W83-70415 Siravity Research W83-70451 W83-70026 W83-70026 W83-70064 W83-70065 W83-70096 W83-70096 W83-70109 W83-70110 W83-70185 W83-70098	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develop 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support Systems 199-60-10 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 WATER VAPOR Meteorological Lidar Development 146-74-01	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VAANES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Cornets Grain: 154-75-80 VARIABILITY X-Ray Astronomy 188-46-59 VARIABLE THRUST Vanable Thrust OTV Propulsion Technology 506-60-42 VARIANCE (STATISTICS) Solar and Heliospheric Physics Data Analyses 385-38-01 VICEGTATION FILE Flight Experiments-Analysis and Suppoin	d Lift Vehicles W83-70068 W83-70069 W83-70072 Seriments W83-70106 (light Research W83-70107 mgs W83-70133 W83-70152 ST) W83-7015 W83-70115 W83-70368 W83-70315 W83-70388 W83-70210 SW83-70210 SW83-70243	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-23 Rotorcraft Systems Integration 532-06-11 Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Evaluation 533-02-71 Decoupler Pylon Flight Evaluation 533-02-71 Decoupler Pylon Flight Demonstration 533-02-71	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70559 Tracking of the W83-70414 To Sickness W83-70415 Stravity Research W83-70451 W83-70026 W83-70028 W83-70064 W83-70065 W83-70098 W83-70109 W83-70110 W83-70185	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-42 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 50-0-62 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WATER VAPOR Meteorological Lidar Development 146-74-01 Atmospheric Processes Experiments and S 147-10-03	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 508-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANRS Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR DEPOSITION Cystal	d Lift Vehicles W83-70068 W83-70069 W83-70072 Seriments W83-70106 (light Research W83-70107 mgs W83-70133 W83-70152 ST) W83-7015 W83-70115 W83-70368 W83-70315 W83-70388 W83-70210 SW83-70210 SW83-70243	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-23 Rotorcraft Systems Integration 532-06-11 Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Spacecraft Controls and Guidance 506-57-13 VIBRATION ISOLATORS Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-73 VIBRATION ISOLATORS Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-73 VIBRATION IESTS Rotorcraft Vibration and Noise 532-06-18 Rotorcraft Vibration and Noise 532-02-73 VIBRATION IESTS Rotorcraft Vibration and Noise 533-02-73 VIBRATION IESTS Rotorcraft Vibration and Noise	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70559 W83-70559 Tracking of the W83-70562 W83-70414 Sickness W83-70415 Gravity Research W83-70451 W83-70026 W83-70028 W83-70098 W83-70098 W83-70109 W83-70109 W83-70109 W83-70109 W83-70109 W83-70109	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develop 506-64-37 Remote Sensing Applications for Facility Si Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-2 Waste Management for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WATER VAPOR Meteorological Lidar Development 146-74-01 Atmospheric Processes Experiments and S 147-10-03 Stratospheric Research	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-22 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANKS Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain: 154-75-80 VARIABILITY X-Ray Astronomy 188-46-59 VARIABLE THRUST Variable Thrust OTV Propulsion Technology 506-60-42 VARIANCE (STATISTICS) Solar and Hehospheric Physics Data Analyses 385-38-01 VEGETATION FILE Flight ExperimentsAnalysis and Suppoins 542-03-14 Monitoring Large Scale Total Primary P. Desertification Processes with AVHRR Imagery	d Lift Vehicles W83-70068 W83-70069 W83-70072 W83-70106 dight Research W83-70107 ngs W83-70133 W83-70131 W83-70152 ST) W83-70155 W83-70171 S W83-70368 W83-70171 S W83-70368 W83-70171 S W83-70368 W83-70171	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configuration 505-42-11 Rotocraft Systems Integration 532-06-11 Rotocraft Controls and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Spacecraft Controls and Guidance 506-57-13 URBATION ISOLATORS Rotocraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 Neastroln ISOLATORS Rotocraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-71	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70562 W83-70414 Sickness W83-70415 Siravity Research W83-70451 W83-70026 W83-70026 W83-70064 W83-70065 W83-70096 W83-70096 W83-70109 W83-70110 W83-70185 W83-70098	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 Waste Management Froduction and Proce 199-60-62 Systems Management Control and Ecologic for CELSS 199-60-62 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support Systems 199-10-12 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WATER VAPOR Meteorological Lidar Development 146-74-01 Atmospheric Processes Experiments and S 147-10-03 Stratospheric Research 147-30-02 Critical Examination of Upper Stratospheric	W83-70239 ment
V/STOL AIRCRAFT Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Powered 505-43-01 Powered Lift Propulsion Technology 505-43-02 Non-Axisymmetric Nozzle Research 505-43-02 Propulsive-Lift Technology - QSRA Flight Exp 533-02-50 Powered Lift Systems Technology - Harrier F Program 533-02-51 VACUUM DEPOSITION Electrically Conductive Thermal Control Coati 506-53-26 Development of Experiment and Hardware 188-38-51 VALVES Programmable Mask Technology 506-54-17 VANYES Turbine Engine Hot Section Technology (HOS 533-04-12 VAPOR DEPOSITION Crystal Growth Processes 179-80-70 VAPOR PHASE EPITAXY Solar Cell Research 506-55-43 VAPORIZING Cosmic Chemistry Aeronomy Comets Grain: 158-46-59 VARIABILITY X-Ray Astronomy 188-46-59 VARIABLE THRUST Variable Thrust OTV Propulsion Technology 506-60-42 VARIANCE (STATISTICS) Solar and Heliospheric Physics Data Analyses 385-38-01 Flief Right ExperimentsAnalysis and Suppol 542-03-14 Monitoring Large Scale Total Primary P Desertification Processes with AVHRR Imagery 199-30-07 Multisensor Technique Development	d Lift Vehicles W83-70068 W83-70069 W83-70072 W83-70106 dight Research W83-70107 mgs W83-70133 W83-70152 ST) W83-70155 W83-70115 W83-70368 W83-70315 SW83-70368 W83-70316 SW83-70368 W83-70316 SW83-70368 W83-70315 W83-70368 W83-70315	Network Software Design Technology 310-40-72 VERY LONG BASE INTERFEROMETRY Orbiting VLBI Feasibility Study 159-41-03 SERIES - Satellite Emission Range Inferred 676-59-30 Precision Time and Frequency Sources 310-10-42 Radio Metric Technology Development 310-10-60 Space Systems and Navigation Technology 310-10-63 Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS) 310-20-39 VESTIBULAR TESTS Space Motion Sickness 199-20-21 Basic Mechanisms Underlying Space Motion 199-20-22 Vestibular Research Facility (VRF)/Variable of Facility (VGRF) 199-80-32 VIBRATION DAMPING Flight Loads Analysis 505-33-41 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-11 Rotorcraft Systems Integration 532-06-11 Decoupler Pylon Flight Demonstration 533-02-71 Decoupler Pylon Flight Demonstration 533-02-73 VIBRATION ISOLATORS Rotorcraft Vibration and Noise 532-06-13 Decoupler Pylon Flight Demonstration 533-02-73 VIBRATION TESTS Rotorcraft Vibration and Noise 532-06-13	W83-70576 W83-70330 Earth Surveying W83-70510 W83-70556 W83-70557 W83-70562 W83-70414 Sickness W83-70415 Siravity Research W83-70451 W83-70026 W83-70026 W83-70096 W83-70096 W83-70096 W83-70109 W83-70110 W83-70109 W83-70109 W83-70109 W83-70109 W83-70109 W83-70109 W83-70109 W83-70109	WARNING SYSTEMS Aviation Safety Severe Storm Hazards 505-45-03 WASTE DISPOSAL Space Station Life Support Technology 506-64-31 Life Support Systems Technology Develops 506-64-37 Remote Sensing Applications for Facility St Waste Disposal Impact Assessment 677-60-15 WASTE TREATMENT Space Station Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WASTE UTILIZATION Food Requirements Production and Proce 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-52 Systems Management Control and Ecologic for CELSS 199-60-62 WATER FILE Flight ExperimentsAnalysis and Support 542-03-14 WATER CIRCULATION Oceanic Research Support Activities 161-50-00 WATER IMMERSION Operational Laboratory 199-10-12 WATER RECLAMATION Space Station Life Support Technology 506-64-31 Advanced Life Support Systems 199-60-11 Advanced Life Support Systems 199-60-12 WATER VAPOR Meteorological Lidar Development 146-74-01 Atmospheric Processes Experiments and S 147-10-03 Stratospheric Research	W83-70239 ment

WATER WAVES		Man-Machine Engineering Requiremen	ts for Data and	Thermal Protection Systems for Earth-To	o-Orbit STS
Physical Oceanography 161-20-00	W83-70335	Functional Interfaces 199-60-71	W83-70447	506-53-33 WIND TUNNEL WALLS	W83-70137
WATERSHEDS		Cosmos Flight Experiments Project		Test Methods and Instrumentation	
Hydrologic Information Extraction Technique	e Development	199-70-12 Vestibular Research Facility (VRF)/Variable	W83-70448	505-31-51 Experimental Test Techniques	W83-70013
677-22-27 WAVE FUNCTIONS	W83-70519	Facility (VGRF)		505-31-53	W83-70015
Surface Physics and Computational Chemist		199-80-32 Mammalian Development Facility	W83-70451	WIND TUNNELS Forward Swept Wing Support	
506-53-11 WAVE GENERATION	W83-70127	199-80-62	W83-70455	533-02-83	W83-70112
Electronics Research and Technology		WEIGHTLESSNESS SIMULATION		WIND VELOCITY MEASUREMENT	
506-54-15 WAVE PACKETS	W83-70150	Crew Health Maintenance 199-10-32	W83-70410	High Resolution Laser Research 506-54-23	W83 70154
Boundary-Layer Stability and Transition Res	earch	Cardiovascular Deconditioning (JSC)		Tropospheric Wind Measurement Assess	sment
505-31-15 WAVE PROPAGATION	W83-70006	199-20-11 WEST VIRGINIA	W83-70412	146-72-04 Gas Correlation Wind Sensor	W83 70260
Boundary-Layer Stability and Transition Res	earch	Oil and Gas Test Case Study		147-18-02	W83-70275
505-31-15	W83-70006	677-41-16 WETLANDS	W83-70532	Time Dependent Fields 161-20-11	W83-70338
WAVEFORMS Advanced Containerless Processing Technological Container Processing Technol	ogy	Biosphere-Atmosphere Interactions in We		WING LOADING	
179-20-55	W83-70356	199-30-36 WHEEL BRAKES	W83-70431	Advanced Fighter Technology {AFTI-F-111}	Integration/F-111
WAVEGUIDES X-Band Uplink Development		Aircraft Landing Dynamics		533-02-11	W83-70101
310-20-64	W83-70564	505-45-23	W83-70092	WING NACELLE CONFIGURATIONS	
WEAPON SYSTEMS		WIND (METEOROLOGY) Aviation Safety Severe Storm Hazards		Aerodynamics/Propulsion Integration 505-45-43	W83-70093
AFTI/F-16 533-02-61	W83-70108	505-45-03	W83-70085	WING TANKS	1100 70000
WEAR		Safety - Atmospheric Processes 505-45-09	W83-70087	Decoupler Pylon Flight Demonstration 533-02-73	W83-70110
High Temperature Materials 505-33-12	W83-70018	Aircraft Fuel Efficiency Improvement	W63-70067	WINGS	W83-70110
Non-Destructive Evaluation and Tribology		505-45-22	W83-70091	Advanced Structural Analysis Methods	70000
506-53-12 WEATHER	W83-70128	Meteorological Parameter Extraction 146-65-00	W83-70254	505-33-53 Advanced Fighter Technology	W83-70029 Integration/F-111
Meteorological Satellite Data Research		WIND MEASUREMENT	***************************************	(AFTI-F-111)	-
146-60-00	W83-70251	Safety - Atmospheric Processes 505-45-09	W83-70087	533-02-11	W83-70101
Meteorological Satellite Data Research a 146-61-00	md Applications W83-70252	Meteorological Observing System Develop		Forward Swept Wing Support 533-02-83	W83-70112
Numerical Analysis of Remote Sensing Data	1	146-73-00	W83-70262	Structural Integration	
146-66-01 Development of New Remote Data	W83-70255	Atmospheric Processes Experiments and 147-10-03	Systems W83-70265	534-03-13 Conceptual Characterization and Tech	W83-70116
Techniques	Interpretation	WIND PROFILES	***************************************	506-63-29	W83-70218
175-20-00	W83-70347	Tropospheric Wind Measurement Assessn		WORKLOADS (PSYCHOPHYSIOLOGY)	
Remote Sensor Development 175-40-00	W83-70348	146-72-04 WIND SHEAR	W83-70260	Flight Management Systems 505-35-21	W83-70038
WEATHER FORECASTING	1100 10010	B-57B Flight Investigation of Environment		Crew Cockpit Interface Technology	
Meteorological Satellite Data Research	W83-70251	505-45-01 Aviation Safety Severe Storm Hazards	W83-70083	505-35-23	W83-70039
146-60-00 Numerical Analysis of Remote Sensing Data		505-45-03	W83-70085		
146-66-01	W83-70255	Safety - Atmospheric Processes 505-45-09	W02 20007	X	
Meteorological Observing System Developm 146-70-00	ent W83-70256	Operational Problems Fireworthiness and	W83-70087 Crashworthiness	X RAY ASTRONOMY	
Ocean Applications Development Program		505-45-11	W83-70088	Advanced X-Ray Astrophysics Facility (A	XXAF)
161-30-01	W83-70340	WIND TUNNEL APPARATUS Test Methods and Instrumentation		159-46-01	W83-70331
Severe Storms and Local Weather Research 175-13-00	W83-70346	505-31-51	W83-70013	Gamma-Ray Astronomy 188-46-57	W83-70385
WEIGHT REDUCTION		Experimental Test Techniques 505-31-53	W/93 7001E	X-Ray Astronomy	
Fan and Compressor Research 505-40-12	W83-70056	Wind Tunnel Operations	W83-70015	188-46-59 X-Ray Astronomy	W83-70387
Supersonic Aerodynamics Configuration		505-40 72	W83-70063	188-46-59	W83-70388
Carriagorea 9: 64-as rela Tembralami		Low Speed Wind Tunnel Operations		X-Ray Astronomy CCD Instrumentation	Development
Structures & Materials Technology	14/02 70070		W83-70067		
505-43-43	W83-70078 and Systems	505-42-81 High-Speed Wind Tunnel Operations	W83-70067	188-46-59	W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation	and Systems	505-42-81 High-Speed Wind Tunnel Operations 505-43-61	W83-70067 W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph	W83-70389 Pinhole Satellite and
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31		505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION		188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38	W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology	and Systems W83-70136	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53		188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph	W83-70389 Pinhole Satellite and W83-70391
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25	and Systems	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques	W83-70079 W83-70015	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A	W83-70389 Pinhole Satellite and W83-70391
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22	w83-70191 w83-70233	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS	W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (J	W83-70389 Pinhole Satellite and W83-70391
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G	W83-70136 W83-70191 W83-70233 Goddard Support	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNINEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation	W83-70079 W83-70015 W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20	W83-70389 Pinhole Satellite and W83-70391
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26	w83-70136 w83-70191 w83-70233 ioddard Support w83-70236	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS	W83-70079 W83-70015	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE	W83-70389 Pinhole Satellite and W83-70391 AXAF) W83-70331 W83-70353
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager	w83-70136 w83-70191 w83-70233 ioddard Support w83-70236	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53	W83-70079 W83-70015 W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20	W83-70389 Pinhole Satellite and W83-70391 AXAF) W83-70331 W83-70353
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Thological Experiments in Zero Gravity	w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS	W83-70079 W83-70015 W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY	W83-70389 (W83-70391) (W83-70331) (W83-70353) (W83-70353) (W83-70353) (W83-70353)
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager	w83-70191 w83-70233 ioddard Support w83-70236 ment	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11	W83-70079 W83-70015 W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1	W83-70389 (W83-70391) (W83-70331) (W83-70353) (W83-70353) (W83-70353) (W83-70353)
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72	w83-70196 w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238 w83-70245 w83-70354	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES	W83-70389 Prinhole Satellite and W83-70391 W83-70331 W83-70353 Illytical Studies W83-70294
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies	w83-70196 w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238 w83-70245 w83-70354	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11	W83-70079 W83-70015 W83-70013 W83-70015	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy	W83-70389 Prinhole Satellite and W83-70391 W83-70331 W83-70353 shytical Studies W83-70294 Fechnology W83-70151
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology 179-20-55 Sphenical Shell Technology Study	w83-70191 w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238 w83-70245 w83-70354 ogy w83-70356	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNINEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNINEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNINEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics 505-31-21	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 Blytical Studies W83-70294 Fechnology W83-70151
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology 179-20-55 Spherical Shell Technology Study 179-20-57	w83-70191 w83-70238 w83-70238 w83-70238 w83-70245 w83-70354	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics	W83-70079 W83-70079 W83-70013 W83-70015 W83-70004 W83-70005	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamma-	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 Blytical Studies W83-70294 Fechnology W83-70151
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-29 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00	w83-70191 w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238 w83-70245 w83-70354 ogy w83-70356	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-12 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-11 Loads and Aeroelasticity	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004 W83-70005 W83-70007 W83-700013	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 Blytical Studies W83-70294 Fechnology W83-70151
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology-179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies	w83-70196 w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70245 w83-70354 ogy w83-70356 w83-70358	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43	W83-70079 W83-70079 W83-70013 W83-70005 W83-70005 W83-70007 W83-700013 W83-70028	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamr Planetary Exploration 157-03-50 Planetary Instrument Definition	W83-70389 W83-70391 W83-70331 W83-70353 W83-70353 W83-70294 Fechnology W83-70367 na-Ray Methods for W83-70324
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21	w83-70136 w83-70191 w83-70233 ioddard Support w83-70238 w83-70238 w83-70245 w83-70354 ogy w83-70358	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-12 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotoicraft Aeromechanics and Configurati	W83-70079 W83-70079 W83-70013 W83-70005 W83-70005 W83-70007 W83-700013 W83-70028	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X-Ray Astronomy 188-46-59 X-Ray Gamma-Ray and Neutron/Gamr Planetary Exploration 157-03-50 Planetary Instrument Definition 157-0-70	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 Hytical Studies W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70324
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning	w83-70196 w83-70191 w83-70233 ioddard Support w83-70238 w83-70245 w83-70354 ogy w83-70358 w83-70358 w83-70404 w83-70407	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNINEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-12 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configuration 505-42-11 Rotorcraft Aeromechanics and Configuration	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004 W83-70005 W83-70007 W83-70007 W83-70008 W83-70064	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70329 Development W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion	w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238 w83-70245 w83-70354 ogy w83-70356 w83-70358 w83-70404 w83-70404 w83-70407 w83-70413	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotoicraft Aeromechanics and Configurati	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004 W83-70005 W83-70007 W83-70013 W83-70028	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY HUORESCENCE OSCIECTOR SUBMILLIANCE 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X-Ray Astronomy 188-46-59 X-Ray Gamma-Ray and Neutron/Gamma Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E	W83-70389 Prinhole Satellite and W83-70391 W83-70331 W83-70353 Hytical Studies W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70329 Development W83-70329 nergy Astrophysics)
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Sphenical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-12 Basic Mechanisms Underlying Space Motion 199-20-12 Basic Mechanisms Underlying Space Motion	w83-70191 w83-70233 w83-70236 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70407 w83-70413	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Plows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-15 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004 W83-70005 W83-70007 W83-70028 W83-70064 W83-70064 W83-70065 W83-70065	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70329 Development W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology-9-10-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31	w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70238 w83-70245 w83-70354 ogy w83-70356 w83-70358 w83-70404 w83-70404 w83-70407 w83-70413	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-51 Viscous Flows 505-31-11 Viscous Flows 505-31-11 Viscous Plows 505-31-11 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-31 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-21 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70007 W83-70013 W83-70028 ONS W83-70064 W83-70065 W83-70065 W83-70067 Luft Vehicles	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (# 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Garma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (# X-Ray Coronagraphysics Facility (# X-RAY TELESCOPES Advanced X-Ray Astrophysics Facility (# X-RAY TELESCOPES X-RAY TELESCOPES	W83-70389 W83-70391 W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70329 Development W83-70329 Development W83-70329 Astrophysicsl W83-70553
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Sphenical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-12 Basic Mechanisms Underlying Space Motion 199-20-12 Basic Mechanisms Underlying Space Motion	w83-70191 w83-70233 w83-70236 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70407 w83-70413	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-11 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-21 Rotocraft Aeromechanics and Configurati 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Oynamics of Powe 505-43-01 High Performance Aircraft Flight Oyn	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70007 W83-70028 W83-70064 W83-70065 W83-70065 W83-70067 Lift Vehicles W83-70067 Lift Vehicles W83-70067	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A	W83-70389 W83-70311 W83-70311 W83-70311 W83-70311 W83-70151 W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70329 Development W83-70389 nergy Astrophysics) W83-70553
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-32 Muscle Alterations	w83-70191 w83-70233 w83-70236 w83-70238 w83-70245 w83-70354 w83-70356 w83-70404 w83-70407 w83-70413 usickness w83-70416 w83-70417	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Oynamics of Power 505-43-01 High Performance Aircraft Flight Oynamics	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70007 W83-700013 W83-70004 W83-70064 W83-70065 W83-70065 Lift Vehicles W83-70068 amics and Flying	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01) Development of Solar Experiments and 1 188-38-51	W83-70389 W83-70311 W83-70311 W83-70311 W83-70311 W83-70311 W83-70311 W83-70329
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Sphenical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-23 Bone Loss 199-20-31 Bone Alterations 199-20-32 Musice Alterations 199-20-31	w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70245 w83-70256 w83-70356 w83-70358 w83-70404 w83-70416	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-11 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-21 Rotocraft Aeromechanics and Configurati 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Oynamics of Powe 505-43-01 High Performance Aircraft Flight Oyn	W83-70079 W83-70015 W83-70015 W83-70015 W83-70015 W83-70005 W83-70007 W83-70007 W83-70013 W83-70013 W83-70013 W83-70014 W83-70018 W83-70064 W83-70065 W83-70067 sted Lift Vehicles W83-70068 amics and Flying W83-70070	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X-Ray Astronomy CCD Instrumentation 157-03-50 Planetary Instrument Definition 157-00-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 379-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and 1 188-38-51 X-Ray Astronomy CCD Instrumentation	W83-70391 W83-70391 W83-70331 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70329 Development W83-70389 nergy Astrophysics) W83-70553 XXAF) W83-70331 Hardware W83-70372 Development
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-01 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-32 Muscle Alterations 199-20-41 Muscle Altorphy 199-20-42	w83-70191 w83-70233 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70417 w83-70417 w83-70417 w83-70418 w83-70419	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotoicraft Aeromechanics and Configurati 505-42-11 Rotoicraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Power 505-43-01 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-11	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70007 W83-70028 W83-70068 W83-70067 Lift Vehicles W83-70068 W83-70067 W83-70070 S & Controls W83-70070	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01) Development of Solar Experiments and 1 188-38-51	W83-70389 W83-70311 W83-70311 W83-70311 W83-70311 W83-70311 W83-70311 W83-70329
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology-9-10-20 Advanced Containerless Processing Technology 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-41 Muscle Atrophy 199-20-41 Muscle Atrophy 199-20-42 Blood Alterations (Influence of Space flight)	w83-70191 w83-70233 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70417 w83-70417 w83-70417 w83-70418 w83-70419	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-12 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-12 Test Methods and Instrumentation 505-31-13 Experimental/Theoretical Aerodynamics 505-31-11 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Power 505-43-01 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-11	W83-70079 W83-70015 W83-70015 W83-70015 W83-70015 W83-70005 W83-70007 W83-70007 W83-70013 W83-70013 W83-70064 W83-70064 W83-70065 W83-70068 amics and Flying W83-70070 s & Controls W83-70071 ttng	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamr Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and I 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X RAYS Biological Effects of Particle Radiation	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70329 Development W83-70329 Development W83-70389 W83-70331 Hardware W83-70331 Development W83-70331
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-22 In-Space Fluid Management Technology - G 506-64-29 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Basic Mechanisms Underlying Space Motion 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-41 Muscle Atrophy 199-20-41 Muscle Atrophy 199-20-51	w83-70191 w83-70233 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70417 w83-70417 w83-70417 w83-70418 w83-70419	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-51 Viscous Flows 505-31-11 Viscous Flows 505-31-11 Viscous Flows 505-31-11 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-13 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Oynamics of Power 505-43-01 High Performance Aircraft Flight Oyn Qualities 505-43-13 Interagency & Industrial Assistance & Tes	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70007 W83-70028 W83-70068 W83-70067 Lift Vehicles W83-70068 W83-70067 W83-70070 S & Controls W83-70070	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY FLUORESCENCE Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01) Development of Solar Experiments and 1 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X-RAYS	W83-70391 W83-70391 W83-70331 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70324 W83-70329 Development W83-70389 nergy Astrophysics) W83-70553 XXAF) W83-70331 Hardware W83-70372 Development
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology-9-179-20-55 Spherical Shell Technology Study 179-20-55 Spherical Shell Technology Study 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-20 Medical Operations Longitudinal Studies 199-10-21 Basic Mechanisms Underlying Space Motion 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-41 Muscle Atrophy 199-20-42 Blood Alterations (Influence of Space flight and Blood-Forming Tissues) 199-20-51 Blood Alterations	w83-70191 w83-70233 ioddard Support w83-70238 w83-70245 w83-70245 w83-70354 v83-70356 w83-70404 w83-70407 w83-70417 w83-70417 w83-70417 w83-70418 w83-70418 w83-70418 w83-70419 t on the Blood w83-70420	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Experimental/Theoretical Aerodynamics 505-31-21 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-43-01 High Performance Aircraft Flight Dyn Qualities 505-43-13 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-32 High-Speed Wind Tunnel Operations	W83-70079 W83-70015 W83-70015 W83-70015 W83-70015 W83-70005 W83-70007 W83-70007 W83-70013 W83-70013 W83-70064 W83-70064 W83-70065 W83-70068 amics and Flying W83-70070 s & Controls W83-70071 ttng	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and I 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X RAYS Biological Effects of Particle Radiation 199-20-72	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70329 Development W83-70329 Development W83-70389 W83-70331 Hardware W83-70331 Development W83-70331
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-57 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-01 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-32 Muscle Alterations 199-20-41 Muscle Altrophy 199-20-42 Blood Alterations (Influence of Space flight and Blood-Forming Tissues) 199-20-51 Blood Alterations	w83-70191 w83-70233 ioddard Support w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70356 w83-70404 w83-70417 w83-70416 w83-70417 w83-70418 w83-70418 w83-70419 t on the Blood	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Viscous Drag Reduction and Control 505-31-12 Test Methods and Instrumentation 505-31-11 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Aeromechanics and Configurati 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Power 505-43-11 High Performance Aircraft Flight Dyn Cualities 505-43-11 High Performance Aircraft Flight Dyn S05-43-13 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-32 High-Speed Wind Tunnel Operations	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004 W83-70005 W83-70007 W83-70064 W83-70064 W83-70065 W83-70065 W83-70065 W83-70065 W83-70065 W83-70067 ared Lift Vehicles W83-70068 amics and Flying W83-70070 to & Controls W83-70071 ting W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamr Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and I 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X RAYS Biological Effects of Particle Radiation	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70329 Development W83-70329 Development W83-70389 W83-70331 Hardware W83-70331 Development W83-70331
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Spherical Shell Technology Study 179-20-55 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-42 Blood Alterations 199-20-44 Blood Alterations (Influence of Space flight and Blood-Forming Tissues) 199-20-51 Blood Alterations 199-20-51 Blood Alterations 199-20-51 Blood Alterations	w83-70191 w83-70233 ioddard Support w83-70238 w83-70245 w83-70245 w83-70354 v83-70356 w83-70404 w83-70407 w83-70417 w83-70417 w83-70417 w83-70418 w83-70418 w83-70418 w83-70419 t on the Blood w83-70420	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-13 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Power 505-43-01 High Performance Aircraft Flight Dynamics 505-43-13 Interagency & Industrial Assistance & Tes 505-43-3 High-Speed Wind Tunnel Operations 505-43-6 High-Speed Wind Tunnel Operations 505-43-13 Interagency & Industrial Assistance & Tes 505-43-6 Aerodynamics/Propulsion Integration 505-45-43	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70007 W83-70028 W83-70064 W83-70065 W83-70065 W83-70067 Lift Vehicles W83-70068 W83-70067 Lift Vehicles W83-70070 S & Controls W83-70071 Ling W83-70071	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamr Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and I 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X RAYS Biological Effects of Particle Radiation 199-20-72	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70329 Development W83-70329 Development W83-70389 W83-70331 Hardware W83-70331 Development W83-70331
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 WEIGHTLESSNESS Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-27 In-Space Fluid Management Technology - G 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology-179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-41 Muscle Atrophy 199-20-41 Muscle Atrophy 199-20-51 Blood Alterations (Influence of Space flight and Blood-Forming Tissues) 199-20-51 Blood Alterations 199-20-61 Fluid and Electrolyte Change	w83-70191 w83-70233 w83-70236 ment w83-70245 w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70407 w83-70413 w83-70416 w83-70416 w83-70416 w83-70416 w83-70417 w83-70418 w83-70418 w83-70419 t on the Blood w83-70420 w83-70421	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL TESTS Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Viscous Drag Reduction and Control 505-31-12 Test Methods and Instrumentation 505-31-11 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Aeromechanics and Configurati 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Power 505-43-11 High Performance Aircraft Flight Dyn Cualities 505-43-11 High Performance Aircraft Flight Dyn S05-43-13 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-32 High-Speed Wind Tunnel Operations	W83-70079 W83-70015 W83-70013 W83-70015 W83-70004 W83-70005 W83-70007 W83-70064 W83-70064 W83-70065 W83-70065 W83-70065 W83-70065 W83-70065 W83-70067 ared Lift Vehicles W83-70068 amics and Flying W83-70070 to & Controls W83-70071 ting W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY FLUORESCENCE Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X-Ray Gamma-Ray and Neutron/Gamma Planetary Exploration 157-03-50 Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and I 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 Rological Effects of Particle Radiation 199-20-72	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70331 W83-70353 W83-70151 W83-70151 W83-70387 ma-Ray Methods for W83-70324 W83-70324 W83-70329 Development W83-7053 WASP W83-7031 Hardware W83-70372 Development W83-70389 W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Spherical Shell Technology Study 179-20-55 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Bone Alterations 199-20-42 Blood Alterations 199-20-44 Blood Alterations (Influence of Space flight and Blood-Forming Tissues) 199-20-51 Blood Alterations 199-20-51 Blood Alterations 199-20-51 Blood Alterations	w83-70191 w83-70191 w83-70233 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70356 w83-70404 w83-70407 w83-70413 w83-70416 w83-70417 w83-70418 w83-70418 w83-70419 t on the Blood w83-70420 w83-70420	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-31-51 Experimental Test Techniques 505-31-51 Experimental Test Techniques 505-31-51 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Viscous Drag Reduction and Control 505-31-12 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-13 Experimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-11 Resperimental/Theoretical Aerodynamics and Configurate 505-31-31 Resperimental/Theoretical Aerodynamics of Power 505-42-11 Resperimental/Theoretical Aerodynamics of Power 505-43-01 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-31 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-31 Resperimental/Systems Integration 505-55-43 Resperimental/Systems Integration 505-45-53 Resperimental/Systems Integration 505-44-5panwise Blowing	W83-70079 W83-70015 W83-70015 W83-70015 W83-70015 W83-70005 W83-70007 W83-70028 W83-70028 W83-70064 W83-70065 W83-70065 W83-70066 W83-70067 Lift Vehicles w83-70067 Lift Vehicles w83-70071 Ling W83-70071 Ling W83-70071 W83-70079 W83-70079 W83-70079 W83-70096	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (# 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-20-70 Y-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (# 159-46-01 Development of Solar Experiments and 1 188-38-51 X-Ray Astronomy CCD Instrumentation 189-20-72 Y YAG LASERS Meteorological Lidar Development 146-74-01	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70353 W83-70294 Fechnology W83-70151 W83-70387 na-Ray Methods for W83-70329 Development W83-70329 Development W83-70389 W83-70331 Hardware W83-70331 Development W83-70331
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Reference From Systems Protection 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-27 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technology 179-20-55 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-20 Medical Operations Longitudinal Studies 199-10-21 Basic Mechanisms Underlying Space Motion 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-13 Bone Alterations 199-20-31 Bone Alterations 199-20-31 Bone Alterations 199-20-41 Muscle Alterations 199-20-55 Fluid and Electrolyte Change 199-20-51 Fluid and Electrolyte Changes 199-20-62 General biomedical Research	w83-70191 w83-70233 w83-70236 ment w83-70245 w83-70245 w83-70245 w83-70356 w83-70358 w83-70404 w83-70407 w83-70413 w83-70416 w83-70416 w83-70416 w83-70416 w83-70417 w83-70418 w83-70418 w83-70419 t on the Blood w83-70420 w83-70421	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-51 Viscous Flows 505-31-11 Viscous Flows 505-31-11 Viscous Flows 505-31-11 Loads and Aeroelasticity 505-31-21 Test Methods and Instrumentation 505-31-13 Loads and Aeroelasticity 505-33-43 Rotocraft Aeromechanics and Configurati 505-42-11 Rotocraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Flight Dynamics of Power 505-43-13 Interagency & Industrial Assistance & Tes 505-43-31 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-33 Rotocraft Systems Integration 505-43-31 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-31 Rotocraft Systems Integration 505-43-31 Rotocraft Systems Integration 532-06-11 F-4 Spanwise Blowing 533-02-33	W83-70079 W83-70015 W83-70013 W83-70015 W83-70005 W83-70007 W83-70013 W83-70013 W83-70013 W83-70064 W83-70065 W83-70065 W83-70068 amics and Flying W83-70070 s & Controls W83-70071 ting W83-70075 W83-70079 W83-70079	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-03-50 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and in 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X RAYS Biological Effects of Particle Radiation 199-20-72 Y YAG LASERS Meteorological Lidar Development 146-74-01 19F-12 AIRCRAFT	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70331 W83-70353 W83-70151 W83-70151 W83-70387 ma-Ray Methods for W83-70324 W83-70324 W83-70329 Development W83-7053 WASP W83-7031 Hardware W83-70372 Development W83-70389 W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tinbological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-57 Spherical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-01 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-22 Bone Loss 199-20-31 Muscle Alterations 199-20-32 Muscle Alterations 199-20-41 Muscle Alterations 199-20-51 Blood Alterations 199-20-52 Fluid and Electrolyte Change 199-20-52 Fluid and Electrolyte Change 199-20-65 Fluid and Electrolyte Change 199-20-66 Fluid and Electrolyte Change 199-20-66 Fluid and Electrolyte Change 199-20-66	w83-70191 w83-70236 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70356 w83-70358 w83-70404 w83-70413 a) Sickness w83-70416 w83-70417 w83-70416 w83-70417 w83-70418 w83-70419 t on the Blood w83-70420 w83-70423 w83-70423	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNNEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-31-51 Experimental Test Techniques 505-31-51 Experimental Test Techniques 505-31-51 Viscous Flows 505-31-11 Viscous Drag Reduction and Control 505-31-11 Viscous Drag Reduction and Control 505-31-12 Experimental/Theoretical Aerodynamics 505-31-12 Test Methods and Instrumentation 505-31-13 Experimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-11 Resperimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-11 Resperimental/Theoretical Aerodynamics and Configurate 505-31-31 Resperimental/Theoretical Aerodynamics of Power 505-42-11 Resperimental/Theoretical Aerodynamics of Power 505-43-01 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-31 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-31 Resperimental/Systems Integration 505-55-43 Resperimental/Systems Integration 505-45-53 Resperimental/Systems Integration 505-44-5panwise Blowing	W83-70079 W83-70015 W83-70015 W83-70015 W83-70015 W83-70005 W83-70007 W83-70028 W83-70028 W83-70064 W83-70065 W83-70065 W83-70066 W83-70067 Lift Vehicles w83-70067 Lift Vehicles w83-70071 Ling W83-70071 Ling W83-70071 W83-70079 W83-70079 W83-70079 W83-70096	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (# 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-20-70 Y-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (# 159-46-01 Development of Solar Experiments and 1 188-38-51 X-Ray Astronomy CCD Instrumentation 189-20-72 Y YAG LASERS Meteorological Lidar Development 146-74-01	W83-70389 Pinhole Satellite and W83-70391 W83-70331 W83-70331 W83-70353 W83-70151 W83-70151 W83-70387 ma-Ray Methods for W83-70324 W83-70324 W83-70329 Development W83-7053 WASP W83-7031 Hardware W83-70372 Development W83-70389 W83-70389
505-43-43 Thermal Protection Systems Materials Evaluation 506-53-31 Teleoperator Human Interface Technology 506-57-25 Platform Systems Operations 506-64-22 In-Space Fluid Management Technology - G 506-64-26 Teleoperations and Cryogenic Fluid Manager 506-64-29 Tribological Experiments in Zero Gravity 542-03-27 Bioprocessing Studies 179-13-72 Advanced Containerless Processing Technolog 179-20-55 Sphenical Shell Technology Study 179-20-57 Inflight Medical Support 199-10-00 Medical Operations Longitudinal Studies 199-10-21 Cardiovascular Deconditioning 199-20-12 Basic Mechanisms Underlying Space Motion 199-20-23 Bone Loss 199-20-31 Bone Alterations 199-20-42 Blood Alterations 199-20-44 Blood Alterations (Influence of Space flight and Blood-Forming Tissues) 199-20-51 Blood Alterations 199-20-52 Fluid and Electrolyte Change 199-20-51 Fluid and Electrolyte Changes 199-20-61 Fluid and Electrolyte Changes 199-20-63 General biomedical Research 199-20-99 Developmental Biology	w83-70191 w83-70191 w83-70236 w83-70236 ment w83-70245 w83-70245 w83-70356 w83-70356 w83-70404 w83-70407 w83-70415 w83-70416 w83-70417 w83-70416 w83-70417 w83-70418 w83-70419 t on the Blood w83-70422 w83-70422	505-42-81 High-Speed Wind Tunnel Operations 505-43-61 WIND TUNINEL CALIBRATION Experimental Test Techniques 505-31-53 High-Speed Wind Tunnel Operations 505-31-53 Test Methods and Instrumentation 505-31-51 Experimental Test Techniques 505-31-53 WIND TUNNEL MODELS Test Methods and Instrumentation 505-31-11 Viscous Drag Reduction and Control 505-31-11 Viscous Drag Reduction and Control 505-31-11 Experimental/Theoretical Aerodynamics 505-31-21 Test Methods and Instrumentation 505-31-51 Loads and Aeroelasticity 505-33-43 Rotorcraft Aeromechanics and Configurati 505-42-11 Rotorcraft Airframe Systems 505-42-23 Low Speed Wind Tunnel Operations 505-42-81 Geodynamics/Fight Dynamics of Power 505-43-01 High Performance Aircraft Flight Dynamics 505-43-11 High Performance Aircraft Flight Dynamics 505-43-13 Interagency & Industrial Assistance & Tes 505-43-32 High-Speed Wind Tunnel Operations 505-43-32 High-Speed Wind Tunnel Operations 505-43-33 Rotorcraft Systems Integration 505-45-43 Rotorcraft Systems Integration 505-45-43 Rotorcraft Systems Integration 505-45-43 Rotorcraft Systems Integration 532-06-11 F-4 Spanwise Blowing 533-02 33 Support for Forward Swept Wing (X-29A)	W83-70079 W83-70015 W83-70015 W83-70015 W83-70015 W83-70005 W83-70007 W83-70007 W83-70028 W83-70068 W83-70068 W83-70067 Lift Vehicles W83-70068 W83-70070 S & Controls W83-70071 ting W83-70071 ting W83-70079 W83-70079 W83-70079 W83-70093 W83-70098	188-46-59 Advanced Mission Study - Solar X-Ray F Long Focal Length Coronagraph 188-78-38 X RAY ASTROPHYSICS FACILITY Advanced X-Ray Astrophysics Facility (A 159-46-01 X RAY DIFFRACTION Glass Research 179-11-20 X RAY FLUORESCENCE Planetary Materials Laboratory and Ana 152-02-40 X RAY IMAGERY Acousto-Optic & Submillimeter Device 1 506-54-16 X RAY SOURCES X-Ray Astronomy 188-46-59 X RAY SPECTROSCOPY X-Ray Gamma-Ray and Neutron/Gamm Planetary Exploration 157-20-70 Planetary Instrument Definition 157-20-70 X-Ray Astronomy CCD Instrumentation 188-46-59 Sounding Rocket Experiments (High E 879-11-46 X RAY TELESCOPES Advanced X-Ray Astrophysics Facility (A 159-46-01 Development of Solar Experiments and I 188-38-51 X-Ray Astronomy CCD Instrumentation 188-46-59 X RAYS Biological Effects of Particle Radiation 199-20-72 Y YAG LASERS Meteorological Lidar Development 146-74-01 YF-12 AIRCRAFT Hypersonic Aeronautics Technology	W83-70389 W83-70391 W83-70391 W83-70391 W83-70393 W83-70294 Fechnology W83-70151 W83-70387 ma-Ray Methods for W83-70329 Development W83-70329 Development W83-70389 W83-70399

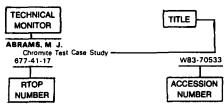
Page Intentionally Left Blank

TECHNICAL MONITOR INDEX

RTOP SUMMARY

FISCAL YEAR 1983

Typical Monitor Index Listing



A title is used to provide a more exact description of the subject matter. The RTOP accession number is used to locate the bibliographic citations and technical summaries in the Summary Section.

Α

ABDALLA, K. L.	
Convertible Engine System Technology	
532-06-12	W83-70097
	VV03-70037
ABRAMS, M J	
Chromite Test Case Study	
677-41-17	W83-70533
ADAMCZYK, J J	
Computational Fluid Dynamics for Turbomach	inery
505-31-02	W83-70002
AINSWORTH, J E	
DASIBI Measurement of Ozone	Profile and
Column-Content	****
673-11-00	W83-70498
	1100 10400
ALEXOVICH, R E	
Satellite Communications Research and Tech	
506-58-22	W83-70200
ALLEY, R E	
IPL Upgrade Interactive Display/Virtual Roa	
677-80-22	W83-70550
ALTCHULER, S I	
Bone Loss	
199-20-31	W83-70416
AMBRUS, J H	
Space Energy Conversion Support	
506-55-70	W83-70178
Multidisciplinary Research	
506-56-20	W83-70184
ANDERSEN, T. A	7700
ER SEASAT Digital SAR Processing	
677-48-01	W83-70545
ARNAIZ, H H	1100 70040
Highly Maneuverable Aircraft Technology F	light Research
533-03-11	W83-70114
ARNOLD, J O	VV03-70114
Advanced Computational Concepts	
505-37-21	W83-70052
Surface Physics and Computational Chemistry	W83-70127
506-53-11	W03-70127
ARRINGTON, J. P	T
Technology Requirements for Advanced Space	ransportation
Systems	
506-63-23	W83-70216
AUSTIN, R E	
Conceptual Characterization and Technolog	
506-63-29	W83-70218
High Energy Upper Stage	
906-63-00	W83-70582
AXLEY, B D	
Flight Support	

AXLEY, B D	
Flight Support	14/00 70110
533-02-91	W83-70113
В	
BACK, L	
Aviation Safety Technology - Applied Fluid M	lechanics/Fire
Materials Modeling	
505-45-15	W83-70089
BAGWELL, J W	
Space Communications Systems Antenna Tec	hnology
650-60-20	W83-70474
Satellite Switching and Processing Systems	
650-60-21	W83-70475
RF Components for Satellite Communications	Systems
650-60-22	W83-70476
Communications Laboratory for Transponder	Development
and Satellite Network Evaluation	
650-60-23	W83-70477
BAILEY, F R	
Numerical Aerodynamic Computational Techni	ques
505-37-01	W83-70049
BAILLIE, R F	
Manned Facilities	
906-54-00	W83-70578
Advanced Transportation	
906-63-00	W83-70583
Orbital Services	
906-75-00	W83-70592

Advanced Concepts 906-80-00	W83-70593
BALL, C L Fan and Compressor Research	
505-40-12 BANGS, W F	W83-70056
Dynamic Acoustic and Thermal Environm	
Experiment (Transportation Technology Ver Program)	
506-63-39 BARBER, M R	W83-70225
Decoupler Pylon Flight Evaluation 533-02-71	W83-70109
BARMATZ, M	1103-10105
Multimode Acoustic Research 179-15-20	W83-70355
BARNES, W L. Multispectral Linear Array for Remote Sensing	1
677-27-01 BATHKER, D A	W83-70520
Antenna Systems Development	14/00 70505
310-20-65 BAUER, E	W83-70565
Use of Thematic Mapper Data for Ele- Transmission Corridor Analysis and Siting	ctrical Utility
677-60-19 BEHREND, A F	W83-70549
Life Support Systems Technology Developmen	nt W83-70240
506-64-37 BEJCZY, A K	W63-70240
Teleoperator Human Interface Technology 506-57-25	W83-70191
BENCZE, D P High-Speed Wind Tunnel Operations	
505-43-61	W83-70079
BERCAW, R W Advanced Concepts in Energy Conversion	
506-55-12 BERKE, L.	W83-70165
Engine Dynamics and Aeroelasticity 505-33-42	W83-70027
BERRY, D T	
Space Shuttle Orbiter Flying Qualities Criteria 506-63-40	W83-70226
BERRY, W E Sample Bank	
199-70-32 Large Primate Facility	W83-70449
199-80-52	W83-70454
Mammalian Development Facility 199-80-62	W83-70455
BILLINGSLEY, F C Attitude Tracker Feasibility Study	
677-29-17 BLACK, D C	W83-70525
Detection of Other Planetary Systems	
196-41-68 BLANCHARD, D P	W83-70398
Curation of Extraterrestrial Samples 152-04-40	W83-70296
BLANCHARD, R C Shuttle Upper Atmosphere Mass Spectron	
506-63-37	W83-70224
High Resolution Accelerometer Package (HiRA Development	
506-63-43 BOBBITT, P J	W83-70228
Computational and Analytical Fluid Dynamics 505 31-03	W83-70003
Experimental/Applied Aerodynamics	
505-31-23 Experimental Test Techniques	W83-70008
505-31-53 F-4 Spanwise Blowing	W83-70015
533-02-33 Forward Swept Wing Support	W83-70104
533-02-83	W83-70112
BOESE, R W Planetary Astronomy and Supporting Labora	tory Research
196-41-67 BOGGESS, A	W83-70397
UV and Optical Astronomy 188-41-51	W83.70300
BOLDT, E A	W83-70380
X-Ray Astronomy 188-46-59	W83-70387
Sounding Rocket Experiments (High Energy 879-11 46	
BOREHAM, J F	
Deep Space and Advanced COMSAT Com Technology	
506-58 25 BORN, G H	W83-70202
Gulf of Mexico Circulation Studies 161-20-10	W83-70337

BOUNDY, R A Research of the use of Space Resources 179-46-20	W83-70361
BOWER, R E High Performance Aircraft Flight Dynamics &	Controls
505-43-13 Aerodynamics/Propulsion Integration	W83-70071
505-45-43 BRANDHORST, H W Photographic Paragraph and Toobaclesis	W83-70093
Photovoltaic Research and Technology 508-55-42 BRANDT, J C	W83-70170
Imaging Studies of Comets 196-41-52	W83-70395
BRECKINRIDGE, J B Luminescence Detector from Space 677-29-22	W83-70527
BREDEKAMP, J H Improved On-Line Availability of Data	
656-50-01 8ROWELL, E V Meteorological Lidar Development	W83-70487
146-74-01 BROWN, R L.	W83-70263
Commercial Materials Processing in Low-Grav 179-60-62	ity W83-70362
Space Operations Study Follow on	
906-64-20 Space Station Ground Operations Study Foll	W83-70584 low on Study
906-64-22	W83-70586
BRYANT, N A Land Cover Multisensor Analysis	
677-21-25 BRYANT, R G	W83-70514
Interagency Assistance and Testing - Dryden 505-43-31	W83-70074
F-4C Spanwise Blowing Flight Investigations 533-02-31 BUCHANAN, H J	W83-70103
Large Space Systems Technology Control 506-57-19 BUFTON, J	and Guidance W83-70188
Sensor Research and Technology 506-54-26	W83-70156
BULL, J S Rotorcraft Flight Guidance Systems Technolog 532-01-11	y W83-70094
BUNGO, M W Cardiovascular Deconditioning (JSC)	
BUNGO, M W	W83-70094
BUNGO, M W Cardiovascular Deconditioning (JSC)	
BUNGO, M W Cardiovascular Deconditioning (JSC)	
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60	
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09	W83-70412
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBLL, T G	W83-70412 W83-70557 W83-70087
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Developm for Large Aperture Deployable Reflectors	W83-70412 W83-70557 W83-70087 nent Program
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Developin	W83-70412 W83-70557 W83-70087
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Developm for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J	W83-70557 W83-70567 nent Program W83-70201 W83-70595
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Developn for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03	W83-70557 W83-70567 nent Program W83-70201 W83-70595
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Developn for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D	W83-70557 W83-70567 nent Program W83-70201 W83-70595
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Developm for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Ouasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02	W83-70557 W83-70567 ment Program W83-70201 W83-70595 c Nuclei and
C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Development for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quals Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis	W83-70557 W83-70567 nent Program W83-70201 W83-70595 c Nuclei and W83-70381
BUNGO, M W Cardiovascular Deconditioning (JSC) 199-20-11 C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMP, B L, T G Multiple Beam Antenna Technology Developm for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 908-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02 CARTER, A L Flight Loads Analysis	W83-70412 W83-70557 W83-70087 nent Program W83-70201 W83-70595 c Nuclei and W83-70381 W83-70343
CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Development for Large Aperture Deployable Reflectors 506-85-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02 CARTER, A L Flight Loads Analysis 506-33-41 Structures Analysis and Synthesis 506-53-51 CASSEN, P M Formation Evolution and Stability of Proto	W83-70412 W83-70557 W83-70087 ment Program W83-70201 W83-70595 c Nuclei and W83-70381 W83-70343 W83-70343 W83-70142 Stellar Disks
CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMP, B W Multiple Beam Antenna Technology Development for Large Aperture Deployable Reflectors 506-85-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02 CARTER, A L Flight Loads Analysis 505-33-41 Structures Analysis and Synthesis 506-53-51 CASSEN, P M Formation Evolution and Stability of Proto 153-01-60 CAW, L J	W83-70557 W83-70557 w83-70595 c Nuclei and W83-70343 W83-70026 W83-70142 Stellar Disks W83-70298
CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMP, B W Multiple Beam Antenna Technology Development for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02 CARTER, A L Flight Loads Analysis 505-33-41 Structures Analysis and Synthesis 506-53-51 CASSEN, P M Formation Evolution and Stability of Proto 153-01-60 CAW, L J	W83-70412 W83-70557 W83-70087 ment Program W83-70201 W83-70595 c Nuclei and W83-70381 W83-70343 W83-70343 W83-70142 Stellar Disks
C CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Development of Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-20 CARTER, A L Flight Loads Analysis 506-53-51 CASSEN, P M Formation Evolution and Stability of Proto 153-01-60 CAW, L J Advanced Fighter Technology Integ (AFTI-F-111) 533-02-11 CHACKERIAN, C, JR	W83-70412 W83-70557 W83-70557 W83-70201 W83-70201 W83-70343 W83-70343 W83-70142 W83-70142 W83-70142 W83-70142 W83-70142 W83-70142 W83-70142
CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Development for Large Aperture Deployable Reflectors 506-58-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02 CARTER, A L Flight Loads Analysis 505-33-41 Structures Analysis and Synthesis 506-53-51 CASSEN, P M Formation Evolution and Stability of Proto 153-01-60 CAW, L J Advanced Fighter Technology Integ (AFTI-F-111) 533-02-11 CHACKERIAN, C, JR Quantitative Infrared Spectroscopy of Minor Cathe Earth S Stratosphere	W83-70412 W83-70557 W83-70087 ment Program W83-70201 W83-70381 W83-70343 W83-70343 W83-70142 -Stellar Disks W83-70298 rration/F-111 W83-70101 postituents of
CALLAHAN, P S Radio Metric Technology Development 310-10-60 CAMP, D W Safety - Atmospheric Processes 505-45-09 CAMPBELL, T G Multiple Beam Antenna Technology Development for Large Aperture Deployable Reflectors 506-85-23 CAREY, W T Geostationary Platform Bus Definition 906-90-03 CAROFF, L J Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects 188-41-53 CARSEY, F D Coupled Active-Passive Sea Ice Analysis 161-40-02 CARTER, A L Flight Loads Analysis 505-33-41 Structures Analysis and Synthesis 506-53-51 CASSEN, P M Formation Evolution and Stability of Proto 153-01-60 CAW, L J Advanced Fighter Technology Integ (AFTI-F.111) 533-02-11 CHACKERIAN, C, JR Quantitative Infrared Spectroscopy of Minor Ce	W83-70412 W83-70557 W83-70557 W83-70201 W83-70201 W83-70343 W83-70343 W83-70142 W83-70142 W83-70142 W83-70142 W83-70142 W83-70142 W83-70142

Global Weather Research - Advanced Moisture and	DELAROSA, H J	FISHER, D. L.
Temperature Sounder (AMTS) 146-72-02 W83-70259	Advanced Space Transportation Systems Ground Operations	Class VI Computational Capability Support 505-37-31 W83-70053
Ocean Processes Branch Scientific Program Support	906-64-21 W83-70585	FISHMAN, G J
161-50-02 W83-70345	DEMORE, W B	Gamma Ray Astronomy and Related Research
Climate Research Program Support 672-50-06 W83-70497	Chemical Kinetics of the Upper Atmosphere	188-46-57 W83-70384 FLOWER, D A
CHANDRA, S	147-21-03 W83-70278 Photochemistry of the Upper Atmosphere	Global Weather Research - Microwave Pressure Sounder
Upper Atmosphere Research - Satellite Data Analysis	147-22-01 W83-70279	146-72-01 W83-70258
147-41-00 W83-70287 CHAPPELL, C R	Data Survey and Evaluation	FORD, J P Use of SAR for Geologic Mapping
Space Plasma Data Analysis	147-51-02 W83-70291	677-43-16 W83-70539
385-36-01 W83-70458	DENERY, D G	FOSTER, C
CHELTON, D B	Advanced Controls and Guidance 505-34-11 W83-70033	Station Monitor and Control Technology
Time Dependent Fields 161-20-11 W83-70338	DEPAUW, J F	310-20-68 W83-70568 FRANKLIN, J A
CHITWOOD, J S	Flight Test of an Ion Auxiliary Propulsion System (IAPS)	Flight Control Concepts and Reliability Enhancement
Communications TDRSS Follow-On/Intersatellite Links	542-05-12 W83-70248	505-34-01 W83-70030
506-58-26 W83-70203	DERYDER, L. J	FREDERICK, J E
CIBULA, W G Use of TM for the Detection of Mineralization in Vegetated	Technology Systems Analysis Across Disciplines for Permanently Orbiting Space Stations	Critical Examination of Upper Stratospheric Measurements 147-43-00 W83-70288
Terrain Through Inference of Geobotanical Parameters	506-64-13 W83-70230	FREELAND, R E
677-42-04 W83-70536	DIETLEIN, L. F	Advanced Space Structures Antenna Technology
CIEPLUCH, C C	Interdisciplinary Research	Development 506-53-45 W83-70141
Energy Efficient Engine Project 535-01-12 W83-70120	199-90-71 W83-70456	FRIEDMAN, D
CIMINO, J B	DIETRICH, J W Planetary Materials Analysis	Automation Research and Technology for Near-Earth Mission
Space Station Resource Observations Payload Study	152-01-40 W83-70293	Operations
677-29-14 W83-70524 CINTRON-TREVINO, N M	DIXON, T H	506-54-66 W83-70163 FROST, R L.
Muscle Alterations	SIR A Data Analysis	Advanced Equipment Development
199-20-41 W83-70418	677-43-18 W83-70541 DONN. B	199-80-31 W83-70450
COCHRAN, T. H.	Cosmic Chemistry Aeronomy Comets Grains	FUCHS, A J
Electric Propulsion Technology 506-55-22 W83-70168	154-75-80 W83-70315	Attitude/Orbit Technology 310-10-26 W83-70555
Reduced Gravity Combustion Science	DOWDY, M W	FUECHSEL, C F
179-80-51 W83-70366	Advanced Low Thrust Chemical Propulsion Technology 506-60-25 W83-70209	Archival Mass Memory
COCHRANE, J A	DOWNS, G S	506-58-10 W83-70194
Propulsive-Lift Technology - QSRA Flight Experiments 533-02-50 W83-70106	High-Speed Signal Processing Research	
COHEN, E A	310-30-70 W83-70570	G
Millimeter/Submillimeter Laboratory Spectroscopy	DRINKWATER, F J Flight Experiments Support	_
147-23-10 W83-70283	532-07-11 W83-70099	GARBA, J. A.
COLLINS, D J Lidar and Acoustics Applications to Ocean Productivity	DUKE, M B	Space Vehicle Dynamics Methodology 506-53-55 W83-70144
161-30-05 W83-70341	JSC General Operations Support - Planetary Materials 152-05-40 W83-70297	GARREN, J F
COLTRIN, R E	JSC General Operations - Geophysics & Geochemistry	Crew Cockpit Interface Technology
Inlets and Nozzles	153-10-40 W83-70307	505-35-23 W83-70039
505-40-02 W83-70055	DUXBURY, T C	GARRISON, P W Advanced Thermal Control Technology for Croyogenic
Supersonic Propulsion Integration Technology 505-43-42 W83-70077	Data Systems Research and Technology 506-58-15 W83-70197	Propellant Storage
Hypersonic Propulsion Integration Technology		506-64-25 W83-70235
505-43-82 W83-70081	-	GARY, B L.
CONWAY, E J	E	Clear Air Turbulence Studies Using Passive Microwave Radiometers
Advanced Radiant Energy Conversion	CULTMAN O D	505-45-05 W83-70086
506-55-13 W83-70166 Solar Cell Research	ELLEMAN, D D Electrostatic Containerless Processing Technology	GARY, G A
506-55-43 W83-70171	179-20-56 W83-70357	Ground-Based Observations UV and Optical Astronomy 188-41-21 W83-70377
COOK, A M	ELLIOTT, J R	GAUNTNER, D J
Simulation Facilities Operations	Aircraft Controls Theory and Applications 505-34-03 W83-70032	Turbine Engine Hot Section Technology (HOST)
532-08-11 W83-70100	ELLIS. J	533-04-12 W83-70115
COX, K J STS Control and Guidance Technology Development	Space Systems and Navigation Technology	GAUSE, R L. Space Durable Composites and Thermal Control Surfaces
506-57-17 W83-70187	310-10-63 W83-70559	506-53-29 W83-70135
CRABTREE, W L	ELLIS, S Muscle Atrophy	Tribological Experiments in Zero Gravity
Multi-KW Solar Arrays	199-20-42 W83-70419	542-03-27 W83-70245 GELLER, M A
506-55-49 W83-70173	ENGERT, M	General Circulation Modeling of the Stratosphere
CREASY, W K Space Station Operations	Automations Technology for Manned Space Systems 506-54-67 W83-70164	147-32-00 W83-70286
506-64-27 W83-70237	Space Station Communication Technology	GERTSMA, L. W Powered Lift Propulsion Technology
CROUCH, R K	506-58-27 W83-70204	505-43-02 W83-70069
Crystal Growth in Space W83-70246	Automation of Space Transportation Systems 506-63-27 W83-70217	GIBBS, B P
012 00 00	506-63-27 W83-70217 ERWIN, H	Applications Experiments Program Support
Crystal Growth Research 179-80-70 W83-70369	Programmable Mask Technology	646-41-02 W83-70472 GNECCO, A J
CRUZ, M I	506-54-17 W83-70152	Wind Tunnel Operations
Planetary Aerocapture Systems Research and Technology	ESTABROOK, F B Gravitational Wave Astronomy and Cosmology	505-40-72 W83-70063
Development 506-62-25 W83-70214	188-41-22 W83-70378	Interagency & Industrial Assistance & Testing 505-43-32 W83-70075
CURRY, D M	EUDY, R G	GOETZ, A F H
Advanced Carbon-Carbon Panels	Meteorological Observing System Development 146-73-00 W83-70262	High Spectral Resolution Techniques for Geologic Mapping
506-53-37 W83-70138	EVANS, D L.	677-41-14 W83-70531
	New Techniques for Quantitative Analysis of SAR Images	SMIRR Data Analysis 677-41-19 W83-70534
D	677-46-02 W83-70543	GOETZ, R C
D	EVERETT, R K Computational Facilities	Aeroacoustics Research
DABBS, J R	505-37-32 W83-70054	505-31-33 W83-70010 Advanced Structural Alloys
Advanced Mission Study - Solar X-Ray Pinhole Satellite and		505-33-13 W83-70019
Long Focal Length Coronagraph	F	Life Prediction for Structural Materials
188-78-38 W83-70391	•	505-33-23 W83-70022 Composites for Airframe Structures
DAILEY, C C Advanced X-Ray Astrophysics Facility (AXAF)	FARMER, C B	505-33-33 W83-70025
159-46-01 W83-70331	Stratospheric Founer Spectroscopy at Near and Mid IR	Loads and Aeroelasticity
DALY, S F	Wavelengths 147-12-05 W83-70270	505-33-43 W83-70028
Lithospheric Structure and Evolution		Advanced Structural Analysis Methods
676-30-05 W83-70507		
DANIELSEN, E F	FELLER, D L. Research Airport Operation	505-33-53 W83-70029
	FELLER, D. L. Research Airport Operation 534-04-16 W83 10119	
Stratospheric Research 147-30-02 W83-70284	FELLER, D L Research Airport Operation 534-04-16 W83 * 0119 FICHTEL, C E	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design
147-30-02 W83-70284 DASPIT, L. P. JR	FELLER, D. L. Research Airport Operation 534-04-16 W83 * 0119 FICHTEL, C. E. Gamma Ray Astronomy	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050
147-30-02 W83-70284 DASPIT, L. P. JR Low Duration Exposure Facility	FELLER, D L Research Airport Operation 534-04-16 W83 * 0119 FICHTEL, C E Gamma Ray Astronomy 188-46-57 W83-70386 FINKE, R C	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050 Rotorcraft Airframe Systems
147-30-02 W83-70284 DASPIT, L. P. JR Low Duration Exposure Facility 542-04-13 W83-70247	FELLER, D L Research Airport Operation 534-04-16 W83 * 0119 FICHTEL, C E Gamma Ray Astronomy 188-46-57 W83-70386 FINKE, R C Power Systems Management and Distribution	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050 Rotocraft Airframe Systems 505-42-23 W83-70065
147-30-02 W83-70284 DASPIT, L. P. JR Low Duration Exposure Facility 542-04-13 W83-70247 DAUNTON, N. G.	Research Airport Operation 534-04-16 W83 * 0119	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050 Rotorcraft Airframe Systems
147-30-02 W83-70284 DASPIT, L. P. J.R Low Duration Exposure Facility 542-04-13 W83-70247 DAUNTON, N. G Basic Mechanisms Underlying Space Motion Sickness 199-20-22 W83-70415	FELLER, D L Research Airport Operation 534-04-16 W83 * 0119 FICHTEL, C E Gamma Ray Astronomy 188-46-57 W83-70386 FINKE, R C Power Systems Management and Distribution 506-55-72 W83-70179 FINKERTY, A A JPL Petrology Support	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050 Rotocraft Airframe Systems 505-42-23 W83-70065 Aircraft Landing Dynamics 505-45-23 W83-70092 Rotocraft Vibration and Noise
147-30-02 W83-70284 DASPIT, L P, JR Low Duration Exposure Facility 542-04-13 W83-70247 DAUNTON, N G Basic Mechanisms Underlying Space Motion Sickness 199-20-22 W83-70415 DECHER, R	FELLER, D L Research Airport Operation 534-04-16 FICHTEL, C E Gamma Ray Astronomy 188-46-57 FINKE, R C Power Systems Management and Distribution 506-55-72 FINNERTY, A A JPL Petrology Support 153-02-70 W83-70300	\$05-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050 Rotocraft Arrframe Systems 505-42-23 W83-70065 Aircraft Landing Dynamics 505-45-23 W83-70092 Rotocraft Vibration and Noise 532-06-13 W83-70098
147-30-02 W83-70284 DASPIT, L. P. J.R Low Duration Exposure Facility 542-04-13 W83-70247 DAUNTON, N. G Basic Mechanisms Underlying Space Motion Sickness 199-20-22 W83-70415	FELLER, D L Research Airport Operation 534-04-16 W83 * 0119 FICHTEL, C E Gamma Ray Astronomy 188-46-57 W83-70386 FINKE, R C Power Systems Management and Distribution 506-55-72 W83-70179 FINKERTY, A A JPL Petrology Support	505-33-53 W83-70029 Community Response to Noise 505-35-13 W83-70037 Computer-Aided Design 505-37-13 W83-70050 Rotocraft Airframe Systems 505-42-23 W83-70065 Aircraft Landing Dynamics 505-45-23 W83-70092 Rotocraft Vibration and Noise

Detailed Aerothermal Loads 506-51-23	W83-70125	Airborne Radar Operations		K	
Composites for Advanced Space Systems 506-53-23	W83-70131	677-47-03 Hickey, D H	W83-70544	KAHLE, A B	
Thermal Protection Systems for Earth-To-Orb	oit STS	Aeronautics Graduate Research Program 505-36-21	W83-70045	Improved Rock Type Discrimination	
506-53-33 Advanced Space Structures	W83-70137	Rotorcraft Aeromechanics and Configuration	ns	677-41-03 Geological Applications of New Rem	W83-7052 lote Sensin
506-53-43	W83-70140	505-42-11 HILCHEY, J D	W83-70064	Techniques	
Analysis and Design 506-53-53	W83-70143	Life Sciences Payload Accommodations 199-80-48	W83-70453	677-41-23 KAKAR, R K	W83-7053
GOLDSTEIN, M E Fund for Independent Research (Aeronautics)	1	HILDNER, E		Advanced Microwave Sensing of Parameters	Meteorologica
505-36-12	W83-70043	Data Analysis 385-38-01	W83-70459	146-72-05	W83-7026
Graduate Program in Aeronautics 505-36-22	W83-70046	Solar Array Flight Experiment (SAFE) Dyna	amics & Control	KEAFER, L. S Advanced Large Spacecraft Systems Analysis	
GOMERSALL, E W		Augmentation (Flights 1 and 2) 506-62-49	W83-70215	506-62-23	W83-7021
Cosmos Flight Experiments Project 199-70-12	W83-70448	Shuttle Operational Flight Test of a Large S	Solar Array	KEATING, T Geopotential Research Mission (GRM) GRAVS	SAT/MAGSA
Long Duration Life Sciences Satellite Prog 199-80-42	gram Definition W83-70452	542-03-04 HILLMAN, J J	W83-70242	Studies 676-59-10	W83-7050
GOOLSBY, L. D	W83-70452	Atomic and Molecular Properties of Planeta Constituents	ary Atmospheric	KEIL, L. C	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Radio Technical Commission for Aeronautics 534-04-10	(RTCA) W83-70117	154-50-80	W83-70313	Fluid and Electrolyte Changes 199-20-62	W83-7042
GORDON, P. G.		HINKLEY, E D Tropospheric Wind Measurement Assessme	ent	KESSLER, D J	
Extraterrestrial Materials Processing 179-40-62	W83-70359	146-72-04 Hirschberg, M H	W83-70260	Hypervelocity Impact Resistance of Compi 506-53-27	osite Materia W83-7013
GRANT, T L.		Life Prediction for Engine Materials		KETTERER, D T Operations Support Computing Technology	
Future Data Systems Concepts 506-58-11	W83-70195	505-33-22 HOCKENSMITH, R P	W83-70021	310-40-26	W83-7057
GRAVES, J R Multi-100 kW Low Cost Earth Orbital System	ms	Advanced Space Systems for Users of 310-20-46	NASA Networks W83-70563	KIRK, J V Low Speed Wind Tunnel Operations	
506-55-7 9	W83-70183	HOELL, J M	WB3-70503	505-42-81	W83-7006
GREEN, J L. Mass Storage Network R&D		High Resolution Laser Research 506-54-23	W83-70154	KIYA, M K Study of Large Deployable Reflector for	Infrared an
656-42-01 GREENFIELD, M A	W83-70483	HOLDEN, O G AIRLAB Operations		Submillimeter Astronomy	W83-7021
Research in Advanced Material Concepts		505-34-23	W83-70035	506-62-21 KLEIN, H P	W63-7021
505-33-10 GRENANDER, S	W83-70017	HOLLAND, A C Correlative Measurement Improvements		Human Factors Facilities Operations 505-35-01	W83-7003
Automation Technology for Planning Tele Robotics	eoperation and	673-18-00	W83-70502	Flight Management Systems	
506-54-65	W83-70162	HOLLIS, J M Ground-Based Observations of the Sun		505-35-21 Piloted Simulation Technology	W83-7003
GRISAFFE, S J High Temperature Materials		188-38-52	W83-70374	505-35-31 Space Human Factors	W83-7004
505-33-12 GUPTA, A	W83-70018	HOLLOWAY, P F Radiation Effects and Protection		506-57-21	W83-7018
Fundamentals of Mechanical Behavior	of Composite	199-20-76 HOLT, H M	W83-70426	Studies of the Distribution of Elements and M Among Meteorites	Mineral Phase
Matrices 506-53-15	W83-70129	Advanced Navigation Guidance and Con-		152-03-60 Chemical Evolution	W83-7029
Effects of Space Environment on Composites 506-53-25	W83-70132	505-34-13 HOLTON, E M	W83-70034	199-50-12	W83-7043
300-33-23		Biological Adaptation 199-40-32	W83-70433	Organic Geochemistry 199-50-22	W83-7043
н		HOMICK, J. L.	W83-70433	Origin and Evolution of Life 199-50-32	W83-7043
		Space Motion Sickness 199-20-21	W83-70414	Solar System Environments	
HAGYARD, M J Development of Experiments and Hardware for	or Solar Physics	HOOK, W R		199-50-42 Life in the Universe	W83-7043
Research 188-38-51	W83-70370	System Analysis and Evaluation of Permi Orbiting Space Facilities	anently Manned	199-50-52 The Search for Extraterrestrial Intelligence	W83-7043
Ground-Based Observations of the Sun		906-54-20	W83-70579	199-50-62	W83-7043
188-38-52 HANSEN, J	W83-70373	HUBER, W G Manned Facilities (Space Station)		Advanced Life Support Systems 199-60-12	W83-7044
Global Climate Model Development and App 672-30-00	lications W83-70493	906-58-00 HUNTRESS, W T	W83-70581	Advanced Extravehicular Systems 199-60-22	W83-7044
HARRIS, J D		Multi-Sensor Balloon Measurements		Food Requirements Production and Process	ing for CELS
OEX (Orbiter Experiments) Project Support 506-63-31	W83-70219	147-16-01	W83-70274	199-60-42 Waste Management for CELSS	W83-7044
HARRIS, R V. JR Viscous Drag Reduction and Control		•		199-60-52 Systems Management Control and Ecological	W83-7044 Consideration
505-31-13	W83-70005	J		for CELSS	W83-7044
High-Speed Aerodynamics and Propulsion In 505-43-23	W83-70073	JACOBSON, A S		199-60-62 Ames Research Center Initiatives	
Interagency and Industrial Assistance and Te 505-43-33	sting W83-70076	Gamma-Ray Astronomy 188-46-57	W83-70385	199-90-72 KLEIN, M J	W83-7045
High Speed (Super/Hypersonic) Technology		X-Ray Astronomy CCD Instrumentation Dev	/elopment	Radio Astronomy	W02 7040
505-43-83 Harrison, J K	W83-70082	188-46-59 JAFFE, R. L.	W83-70389	196-41-73 KLINGLESMITH, D. A	W83-7040
Structural Assembly Demonstration Expe 906-55-00	w83-70580	Computational Flame Radiation Research 505-31-41	W83-70011	Advanced Technology Image Digitization 656-60-10	W83-7048
HARRISS, R C Biosphere-Atmosphere Interactions in Wetla		JARVIS, C R	VV83-70011	KLOSE, C Oceanic Pilot System	
199-30-36	W83-70431	AFTI/F-16 533-02-61	w83-70108	656-13-40	W83-7047
HARTLE, R E Planetary Aeronomy Theory and Analysis		JEWELL, R E	1100 70100	KOBRIC, M Digital Topographic Mapping	Missio
154-60-80	W83-70314	Platform Systems Study 506-64-19	W83-70232	Requirements/Feasibility Study 677-29-12	W83-7052
HARTOP, R X-Band Uplink Development		JOHNSON, D. L.		KOBRICK, M	
310-20-64 HASBACH, W A	W83-70564	Radio Systems Development 310-20-66	W83-70566	Digital Topographic Mapping Requirements/Feasibility Study	Missio
High Performance Solar Array Research a	and Technology W83-70172	JOHNSON, T V Optical Astronomy		677-29-12	W83 7052
506-55-45 HAWERSAAT, W H		196-41-71	W83-70399	Topographic Mapping Methods 677-43-17	W83 7054
Advanced Communications Technology Sa System Studies	tellite (ACTS)	JONES, H W Digital Mapping of Irrigated Cropland		KOCK, B M Hypersonic Aeronautics Technology	
650-60-26	W83-70478	677-60-11	W83-70547	505-43-81	W83-7008
HEAPS, W S Upper Atmosphere Research - Field Measure		JONES, R M Technology of Advanced Concepts		Integrated Research Aircraft Control (INTERACT)	Technolog
147-11-00 Aircraft Borne LIDAR for O3 and OH Measur	W83-70266	506-55-15	W83-70167	533-02-41 KOCK, E M	W83-7010
673-14-00	W83-70500	JORDAN, S. D. Development of Solar Experiments and Hard	dware	Advanced Fighter Aircraft (F-15)	WP2 7010
HEATH, D F Variability and Trends in Stratospheric Ozor	ne the Middle	188-38-51	W83-70372	533-02-21 Krishen, K	W83-7010
Atmosphere and UV Solar Flux Variations 673-41-00	W83-70504	Experiment Development - Laboratory and T Physics	neoretical Solar	Multifunction SAR Technology 506-54-27	W83 7015
HELFER, D		188-38-53	W83-70376	KUBIAK, E T	
Transportable Applications Executive (TAE) 656-44-10	W83-70486	Solar Physics Data Analysis and Operations 385-38-01	W83-70460	OEX-Advanced Autopilot 506-63-42	W83-7022
HENNINGER, J H Electrically Conductive Thermal Control Coati	nas	JOYCE, A T Land Resources Applied Research		KUNDE, V G Ground-Based Infrared Astronomy	
506-53-26	W83-70133	677-21-29	W83-70517	196-41-50	W83-7039

i	MARGOLIS, J S Laser Laboratory Spectroscopy	MORGAN, S. H., JR Orbiting VLBI Feasibility Study
L	147-23-09 W83-70282	159-41-03 W83-70330
LAMPKIN, B A Geodynamics/Flight Dynamics of Powered Lift Vehicles	MARTIN, M D Digital Image Recovery and Data Management	MORRISON, D R Bioprocessing Studies
505-43-01 W83-70068 Powered Lift Systems Technology - Harrier Flight Research	656-31-02 W83-70482 MASUOKA, E J	179-13-72 W83-70354 MOUAT, D A
Program 533-02-51 W83-70107	Geobotanical Mapping in the Eastern United States 677-42-07 W83-70538	Remote Sensing Techniques for Geobotanical Discrimination of Chromium-Bearing Rock Types
LANE, A L.	MATSON, D L. Asteroids	677-42-05 W83-70537
Planetary Data Network Project 656-80-01 W83-70489	196-41-76 W83-70402	Remote Sensing Applications for Facility Site Selection and Waste Disposal Impact Assessment
LANG, H R Oil and Gas Test Case Study	MAYO, R E Advanced Extravehicular Systems (Space Suit)	677-60-15 W83-70548 MOYD, K I
677-41-16 W83-70532 LANGEL, R. A	199-60-21 W83-70442 MCBRYAR, H	Network Monitor and Control Technology 310-30-69 W83-70569
Crustal Magnetic Field Representation and Verification 677-45-06 W83-70542	Orbital Energy Storage and Power Systems 506-55-57 W83-70176	MUCKEL, G
LARSEN, R L.	MCCALEB, F W Image Processing Technology	General Ground Support Equipment (GSE) Software Technology Extension
Aerospace Computer Science University Research 505-37-20 W83-70051	310-40-46 W83-70574 MCCLESE. D J	656-90-01 W83-70491
Space Computer Science University Research 506-54-50 W83-70158	Gas Correlation Wind Sensor	MUMMA, M J Acousto-Optic & Submillimeter Device Technology
LARSON, H K Thermal Protection Systems Materials and Systems	147-18-02 W83-70275 Infrared Experiment Development	506-54-16 W83-70151
Evaluation 506-53-31 W83-70136	157-04-80 W83-70325 MCCREIGHT, C R	Planetary Instrument Development Program/Planetary Astronomy
OEX Thermal Protection Experiments 506-63-36 W83-70223	Far Infrared Detectors and Cooled Research 506-54-21 W83-70153	157-05-50 W83-70328 Infrared and Sub-Millimeter Astronomy
LAUDENSLAGER, J B	MCDONALD, F B	188-41-55 W83-70382
Development of Resonant Ionization Laser Spectroscopy for Tropospheric NOx Measurements	Particle Astrophysics and Experiment Definition Studies 188-46-56 W83-70383	Advanced Infrared Astronomy and Laboratory Astrophysics 196-41-54 W83-70396
176-40-03 W83-70352 LAUE, J H	High Energy Astrophysics Data Analysis 385-46-01 W83-70464	MURPHY, J D Viscous Flows
Tethered Satellite System (TSS) (System Development) 906-70-00 W83-70590	MCGARRY, F E Software Technology	505-31-11 W83-70004
LEACH, C S Fluid and Electrolyte Change	310-10-23 W83-70554 MCGEE, T J	MURPHY, R E Renewable Resources Field Research and Spacecraft Data
199-20-61 W83-70422	Upper Atmosphere Research - Laboratory Measurements	Analysis 677-21-24 W83-70513
LEE, G Test Methods and Instrumentation	MCGOOGAN, J T	MURRAY, N D Data Systems Research and Technology
505-31-51 W83-70013 LEON, H A	Ocean Advanced Studies 161-10-00 W83-70332	506-58-13 W83-70196
Blood Alterations 199-20-52 W83-70421	MCKENZIE, R L. Photophysics and Optical Information Processing	
LESH, J R Communications Systems Technology Development	506-54-11 W83-70147 MCPETERS, R	N
310-20-67 W83-70567 LEWIS, J L.	Spectroscopic Properties of the Stratosphere 147-44-00 W83-70289	NACHTWEY, D S
Human Factors for Crew Interfaces in Space	MEAD, J M	Radiation Effects and Protection 199-20-71 W83-70424
506-57-27 W83-70192 Man-Machine Engineering Requirements for Data and	Data Analysis Astronomy 385-41-01 W83-70463	Global Ecology 199-30-31 W83-70430
Functional Interfaces 199-60-71 W83-70447	MEINTEL A J. JR Automation Systems Research	NADERI, F
LI. F K Advanced Radar Concepts and Systems Study	506-54-63 W83-70161 Manned Control of Remote Operations	Communications Satellite New Application Notification Studies
677-29-18 W83-70526 LIEBRECHT, P E	506-57-23 W83-70190 Teleoperator and Robotics System Analysis	643-10-02 W83-70469 NARAGHI, M
Very Long Baseline Interferometry (VLBI) Tracking of the Tracking and Data Relay Satellite (TDRS)	506-64-23 W83-70234	Spatial Radar Image Registration 677-48-03 W83-70546
310-20-39 W83-70562	MELBOURNE, W G	
	Advanced Earth Orbiter Radio Metric Technology	NEIGHBORS, A K
LOGAN, J S Inflight Medical Support	Development	NEIGHBORS, A K Gravity Probe - B 188-78-41 W83-70392
	Development 161-10-03 W83-70334 MELFI, S H	Gravity Probe - B 188-78-41 W83-70392 NEIL, E A
Inflight Medical Support 199-10-00 W83-70404 Crew Health Maintenance 199-10-31 W83-70409	Development 161-10-03 W83-70334	Gravity Probe - B 188-78-41 W83-70392 NEIL, E A Meteorological Satellite Data Research 146-60-00 W83-70251
Inflight Medical Support 199-10-00 W83-70404 Crew Health Maintenance 199-10-31 W83-70409 LORRE, J J Application of Digital Image Processing Techniques to	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W	Gravity Probe - B 188-78-41 W83-70392 NEIL, E A Meteorological Satellite Data Research 146-60-00 W83-70251 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253
Inflight Medical Support 199-10-00 W83-70404 Crew Health Maintenance 199-10-31 W83-70409 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 W83-70462	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-06-40 W83-70302	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction
Inflight Medical Support 199-10-00 W83-70404 Crew Health Maintenance 199-10-31 W83-70409 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 W83-70462 LOWELL, C Non-Destructive Evaluation and Tribology	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL, J E Upper Atmosphere Research - Field Measurements	Gravity Probe - B 188-78-41 W83-70392 NEIL, E A Meteorological Satellite Data Research 146-60-00 W83-70251 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 W83-70254 NEILSON, G F
Inflight Medical Support 199-10-00 W83-70404 Crew Health Maintenance 199-10-31 W83-70409 LORRE, J W83-70409 Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 W83-70462 LOWELL, C W83-70128 LOWELL, C W83-70128 LUM, H	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-05-40 W83-70302 MENTALL J E Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Solar Flux in Upper Atmosphere	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 W83-70251 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 W83-70254 NEILSON, G F Glass Research 179-11-20 W83-70353
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 W83-70128	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL W W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL J E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 Absolute Solar Flux and Variability	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems	Development 161-10-03 MELFI, S H Meteorological Observing System Development 146-70-00 MENDELL, W W Manned Lunar Base Study 153-06-40 MENTALL, J E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70273	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 M83-70253 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research 179-11-20 NELSON, H G
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UMM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UNON, J C W83-70122 UNON, J C	Development 161-10-03 W83-70334 MELFI, S H	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 W83-7022	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL J E Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R T Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D C	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UYON, J C Information Sciences Research and Development 656-30-01 W83-70481	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R. T Stratosphere Research Balloon Laser In-Situ Sensor 147-11-04 MIKKELSON, D. C Propeller Research 505-40-32 W83-70508	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research 179-11-20 W83-70254 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 W83-70020 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198 NERHEIM, N Acvitive and Passive Sensor Research
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 COWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 LYON, J C Information Sciences Research and Development	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 MIKKELSON, D. C Propeller Research 505-40-32 W83-70058 MILLER, E. F Technical Consultation Services	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 W83-70254 NEILSON, G F Glass Research 179-11-20 W83-70353 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 W83-70020 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 W83-70155
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 LYON, J C Information Sciences Research and Development 656-30-01 MACK, L. M	Development 161-10-03 W83-70334 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D. C Propeller Research 505-40-32 W83-70058 MILLER, E. F Technical Consultation Services 643-10-01 W83-70466	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 W83-70254 NELSON, G F Glass Research 179-11-20 W83-70353 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 W83-70020 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198 NERHEIM, N M Acvitive and Passive Sensor Research 506-34-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator Support
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UMM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UNON, J C Information Sciences Research and Development 656-30-01	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL, J E Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R T Stratospheric Research Balloon Laser In-Sittu Sensor 147-11-04 W83-70267 MIKKELSON, D C Propeller Research 505-40-32 W83-70058 MILLER, E F Technical Consultation Services 643-10-01 W83-70466 MIQUEL, J Developmental Biology 199-40-22 W83-70432	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research 179-11-20 NELSON, H G Life Prediction Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Glotto Ion Mass Spectrometer Co-Investigator Support 156-03-03 Solar and Heliospheric Physics Data Analyses
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UW83-70462 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UY0N, J C Information Sciences Research and Development 656-30-01 WACK, L M Boundary-Layer Stability and Transition Research 505-31-15 W83-70006 WACK, L M Boundary-Layer Stability and Transition Research 505-31-15 W83-70006	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 Absolute Solar Flux and Variability 673-15-00 W83-70267 MENZIES, R. T Stratosphere Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D. C Propeller Research 505-40-32 W83-70058 MILLER, E. F Technical Consultation Services 643-10-01 W83-70466 MIQUEL, J Developmental Biology	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 W83-70253 MEILSON, G F Glass Research 179-11-20 W83-70353 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 WESON, R W Data Systems Research and Technology 506-58-16 W83-70198 MERHEIM, N M Acvitive and Passive Sensor Research 506-64-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator Support 156-03-03
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 LYON, J C Information Sciences Research and Development 6556-30-01 MACK, L M Boundary-Layer Stability and Transition Research 505-31-15 MAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D. C Propeller Research 505-40-32 W83-70058 MILLER, E. F Technical Consultation Services 643-10-01 MOUEL, J Developmental Biology 199-40-22 W83-70432 MISH, W. H	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 W83-70254 NEILSON, G F Glass Research 179-11-20 W83-70353 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 W83-70020 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198 NERHEIM, N M Acvitive and Passive Sensor Research 506-34-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator 156-03-03 Solar and Heliospheric Physics Data Analyses 885-38-01
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UMM. H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UNON. J C Information Sciences Research and Development 656-30-01 MACK, L M Boundary-Layer Stability and Transition Research 505-31-15 W83-70006 MACBDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 MAGUERI, D J	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 MENTALL, J. Solar Flux and Variability 673-15-00 MENZIES, R. T Stratospheric Research Balloon Laser In-Sittu Sensor 147-11-04 MIKKELSON, D. C Propeller Research 505-40-32 MILLER, E. F Technical Consultation Services 643-10-01 MOULL, J Developmental Biology 199-40-22 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 MOJA, D Ground Operations Associated with Special Flight	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 W83-70253 Meteorological Parameter Extraction 146-65-00 M83-70254 NEILSON, G F Glass Research 179-11-20 W83-70353 NELSON, H G Life Prediction Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 W83-70020 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 W83-70155 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator Support 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 W83-70551
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UWM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UVA3-70160 Infrared Imagery of Shuttle 506-63-35 UVA3-70120 Information Sciences Research and Development 656-30-01 WMACK, L M Boundary-Layer Stability and Transition Research 505-31-15 WAS-70006 WAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-100 WM3-70503 MAGLIERI, D J Supersonic Aerodynamics Configurations Integration Structures & Materials Technology	Development 161-10-03 MELFI, S H Meteorological Observing System Development 146-70-00 MENDELL, W W Manned Lunar Base Study 153-06-40 MENTALL, J E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 MENZIES, R T Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 MIKKELSON, D C Propeller Research 505-40-32 W83-70058 MILLER, E F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 W83-70432 MISH, W H Sciences Directorate Local Area Computer Network 656-85-01 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 W83-7058 W83-7058	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 NEILSON, G F Glass Research 179-11-20 NELSON, H G Life Prediction Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 NEWBURN, R L, JR International Halley Watch
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWBLL, C Non-Destructive Evaluation and Tribology 506-53-12 UM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 LYON, J C Information Sciences Research and Development 656-30-01 WMACK, L M Boundary-Layer Stability and Transition Research 505-31-15 WM3-70006 MAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 WM3-70503 MAGLIERI, D J Supersonic Aerodynamics Configurations Integration	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 Absolute Solar Flux and Variability 673-15-00 W83-70267 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R. T Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D. C Propeller Research 505-40-32 W83-70058 MILLER, E. F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 W83-70490 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations SW83-70587 Orbital Transfer Vehicle Ground Operations SW83-70588	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 Metlson, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 NEWBURN, R L, JR International Halley Watch 156-02-02 Giotto Halley Modeling
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UMH. H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UN9. J C Information Sciences Research and Development 656-30-01 WMACK, L M Boundary-Layer Stability and Transition Research 505-31-15 W83-70006 MAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 WAGLIERI, D J Supersonic Aerodynamics Configurations Integration Structures & Materials Technology 505-43-43 MAH, R W Vestibular Research Facility (VRF)/Vanable Gravity Research	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D. C Propeller Research 505-40-32 W83-7058 MILLER, E. F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 W83-70432 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 W83-70490 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 W83-70587 Orbital Transfer Vehicle Ground Operations Study 906-64-24 W83-70588 Ocean Applications Development Program	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 W83-70254 NEILSON, G F Glass Research 179-11-20 W83-70353 NELSON, H G Life Prediction Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 W83-70020 NELSON, R W Data Systems Research and Technology 506-58-16 W83-70198 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 W83-70551 NEWBURN, R L, JR International Halley Watch 156-02-02 Giotto Halley Modeling 156-03-01 W83-70319
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UORRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 W83-70128 LVN, J C Information Sciences Research and Development 656-30-01 W83-70481 WMACK, L M Boundary-Layer Stability and Transition Research 505-31-15 MAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 W83-70503 MAGLIERI, D J Supersonic Aerodynamics Configurations Integration Structures & Materials Technology 505-43-43 MAH, R W Vestibular Research Facility (VRF)/Variable Gravity Research Facility (VGRF)	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 MENTALL, J. Solar Flux and Variability 673-15-00 MENZIES, R. T Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 MIKKELSON, D. C Propeller Research 505-40-32 MILLER, E. F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 W83-70588 W83-70588 W83-70588 W83-70588	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 Metlson, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 NEWBURN, R L, JR International Halley Watch 156-02-02 Giotto Halley Modeling
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 LYON, J C Information Sciences Research and Development 656-30-01 MACK, L M Boundary-Layer Stability and Transition Research 505-31-15 MAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 W83-70503 MAGLIERI, D J Supersonic Aerodynamics Configurations Integration Structures & Materials Technology 505-43-43 WALPONA W83-70078 MAH, R W Vestibular Research Facility (VRF)/Variable Gravity Research Facility (VGRF) 199-80-32 W83-70451 MALCOLM, A B Advanced Transport Operating Systems	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL, J E Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R T Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 MIKKELSON, D C Propeller Research 505-40-32 W83-70058 MILLER, E F Technical Consultation Services 643-10-01 W83-70466 MIQUEL, J Developmental Biology 199-40-22 W83-70490 MIQUEL, J Ground Operations Associated with Special Flight Demonstrations 906-64-23 W83-70587 Orbital Transfer Vehicle Ground Operations Study 906-64-23 W83-70588 Ocean Applications Development Program 161-30-01 W83-70340 MONTGOMERY, H Soll/Snow Moisture Research and Assessment Mission	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 NeILSON, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator Support 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 NEWBURN, R L, JR International Halley Watch 156-02-02 Giotto Halley Modeling 156-03-01 Comets 196-41-75 NICHOLS, F H, JR
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UMH, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UN9.3 C Information Sciences Research and Development 655-30-01 W83-70481 W83-70481 W83-70481 W83-70481 MACK, L M Boundary-Layer Stability and Transition Research 505-31-15 W83-70006 W83-70006 W83-70006 W83-70006 W83-70078	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D. C Propeller Research 505-40-32 W83-7058 MILLER, E. F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 W83-70432 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 W83-70490 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 W83-70587 Orbital Transfer Vehicle Ground Operations Study 906-64-24 W83-70588 MONTGOMERY, D. R Ocean Applications Development Program 161-30-01 MONTGOMERY, H Soil/Snow Moisture Research and Assessment Mission Study 677-29-05 W83-70521	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteoro
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UORRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 W83-70128 UN) J C Information Sciences Research and Development 656-30-01 W83-70481 WMACK, L M Boundary-Layer Stability and Transition Research 505-31-15 MAEDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 W83-70503 MAGUERI, D J Supersonic Aerodynamics Configurations Integration Structures & Materials Technology 505-43-43 W83-70078 MAH, R W Vestibular Research Facility (VRF)/Variable Gravity Research Facility (VGRF) 199-80-32 W83-70451 MALCOLM, A B Advanced Transport Operating Systems 534-04-13 MALCOLM, G N High Performance Aircraft Flight Dynamics and Flying	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 MBODELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 MENTALL, J. E W83-70269 Solar Flux in Upper Atmosphere 147-15-00 MBOJILER, G. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 MINKELSON, D. C Propeller Research 505-40-32 MILLER, E. F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations Study 906-64-24 MONTGOMERY, D. R Ocean Applications Development Program 161-30-01 MONTGOMERY, H Soil/Snow Moisture Research and Assessment Mission Study 677-29-05 MOORE, R. L Structure and evolution of Solar Magnetic Fields (Laboratory	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 NeILSON, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 NERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator Support 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 NEWBURN, R L, JR International Halley Watch 156-02-02 Giotto Halley Modeling 156-03-01 Comets 196-41-75 NICHOLS, F H, JR Thermo-Gasdynamic Test Complex 506-51-41 NICHOLS, L D
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 LORRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 LOWELL, C Non-Destructive Evaluation and Tribology 506-53-12 LUM, H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 LYON, J C Information Sciences Research and Development 656-30-01 MACK, L M Boundary-Layer Stability and Transition Research 505-31-15 MACDA, K Investigation of Upper Atmosphere Dynamics with Nimbus-7 Satellite Data 673-31-00 MAGLERI, D J Supersonic Aerodynamics Configurations Integration Structures & Materials Technology 505-43-43 MAH, R W Vestibular Research Facility (VRF)/Variable Gravity Research Facility (VGRF) 199-80-32 MALOLIM, A B Advanced Transport Operating Systems 534-04-13 MALCOLIM, G N High Performance Aircraft Flight Dynamics and Flying Qualities 505-43-11 W83-70070	Development 161-10-03 MELFI, S. H Meteorological Observing System Development 146-70-00 MN3-70256 MENDELL, W. W Manned Lunar Base Study 153-06-40 MENTALL, J. E Upper Atmosphere Research - Field Measurements 147-12-00 Solar Flux in Upper Atmosphere 147-15-00 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 MENZIES, R. T Stratosphenc Research Balloon Laser In-Situ Sensor 147-11-04 MIKKELSON, D. C Propeller Research 505-40-32 MILLER, E. F Technical Consultation Services 643-10-01 MIQUEL, J Developmental Biology 199-40-22 MISH, W. H Sciences Directorate Local Area Computer Network 656-85-01 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations Study 906-64-24 MONTGOMERY, D. R Ocean Applications Development Program 161-30-01 MONTGOMERY, H Soil/Snow Moisture Research and Assessment Mission Study 677-29-05 W83-70521 MOORE, R. L Structure and evolution of Solar Magnetic Fields (Laboratory & Theory for Solar Physics) 188-38-53 W83-70375	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteorological Parameter Extraction 146-65-00 MELSON, G F Glass Research 179-11-20 NELSON, H G Life Predicton Fatigue Damage and Environmental Effects in Metals and Composites 505-33-21 NELSON, R W Data Systems Research and Technology 506-58-16 MERHEIM, N M Acvitive and Passive Sensor Research 506-54-25 NEUGEBAUER, M Giotto Ion Mass Spectrometer Co-Investigator Support 156-03-03 Solar and Heliospheric Physics Data Analyses 385-38-01 NEUPERT, W M Sounding Rocket Experiments 879-11-38 NEWBURN, R L., JR International Halley Watch 156-02-02 Gotto Halley Modeling 156-03-01 Comets 196-41-75 NICHOLS, F H., JR Thermo-Gasdynamic Test Complex 506-51-41 NICHOLS, L. D Fluid Mechanics of Turbomachinery/Lewis 505-31-32 W83-70009
Inflight Medical Support 199-10-00 Crew Health Maintenance 199-10-31 UNRE, J J Application of Digital Image Processing Techniques to Astronomical Imagery 385-41-01 UWELL, C Non-Destructive Evaluation and Tribology 506-53-12 UM. H Advanced Concepts for Knowledge-Based Expert Systems 506-54-61 Infrared Imagery of Shuttle 506-63-35 UNN. J C Information Sciences Research and Development 656-30-01 W83-70481 W83-70503 W83-70503 W83-70503 W83-70503 W83-70503 W83-70503 W83-70503 W83-70503 W83-70508 W83-70508	Development 161-10-03 W83-70334 MELFI, S H Meteorological Observing System Development 146-70-00 W83-70256 MENDELL, W W Manned Lunar Base Study 153-06-40 W83-70302 MENTALL, J E Upper Atmosphere Research - Field Measurements 147-12-00 W83-70269 Solar Flux in Upper Atmosphere 147-15-00 W83-70273 Absolute Solar Flux and Variability 673-15-00 W83-70501 MENZIES, R T Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267 MIKKELSON, D C Propeller Research 505-40-32 W83-70058 MILLER, E F Technical Consultation Services 643-10-01 W83-70466 MIQUEL, J Developmental Biology 199-40-22 W83-70432 MISH, W H Sciences Directorate Local Area Computer Network 656-85-01 MOJA, D Ground Operations Associated with Special Flight Demonstrations 906-64-23 W83-70587 Orbital Transfer Vehicle Ground Operations Study 906-64-23 W83-70588 MONTGOMERY, D R Ocean Applications Development Program 161-30-01 W83-70340 MONTGOMERY, D R Structure and evolution of Solar Magnetic Fields (Laboratory 8 Theory for Solar Physics)	Gravity Probe - B 188-78-41 NEIL, E A Meteorological Satellite Data Research 146-60-00 Global Weather Experiment Data Processing and Research 146-64-00 Meteorological Parameter Extraction 146-65-00 Meteoro

o		R		SHAUGHNESSY, J D Flight Simulation Technology 505-35-33	W83-70041
OBERHOLTZER, J D		RAGENT, B		SHERMAN, A	
Long Wavelength Subsurface Sounder 677-29-23	W83-70528	Tropospheric Air Quality - Technology D 146-20-10	evelopment W83-70250	In-Space Fluid Management Technolo 506-64-26	gy - Goddard Support W83-70236
OGILVIE, K W		Atmospheric Processes Experiments and	d Systems W83-70265	SHUMATE, W H	
Improvements in Neutral and Ion Mass Spec 157-04-80	trometry W83-70326	147-10-03 VEGA Balloon Nephelometer Design		Operational Laboratory Support 199-10-11	W83-70405
ONDRUS, P J		157-04-80 RAMLER, J R	W83-70327	SIDWELL, L. Space Calibration of Solar Cells	
Systems Management Technology 310-40-49	W83-70575	New Application Studies		542-03-20	W83-70244
ORTON, G S		643-10-02 Experiment Coordination and Mission Si	W83-70468 upport	SIEMERS, P M Shuttle Entry Air Data System (SEAD	e)
Remote Sensing of Atmospheric Structure 154-40-80	W83-70312	646-41-01 RANDOLPH, J E	W83-70471	506-63-32	W83-70220
		STARPROBE - Advanced Technolog	y Management &	SIEVERS, G K Advanced Turboprop Program	
Р		Planning 188-78-38	W83-70390	535-03-12	W83-70122
•		RANGO, A		SIMPSON, J Severe Storms and Local Weather Re-	search
PAGE, M A	Vahiatas (EDVI)	Hydrologic Information Extraction Tech 677-22-27	W83-70519	175-13-00 Sivertson, w e	W83-70346
Advanced Transportation Shuttle Derived 906-65-00	W83-70589	RANKIN, J G Thermal Management for On-Orbit Ener	ou Suctoms	FILE Flight ExperimentsAnalysis and	Support
PAINTER, W D B-57B Flight Investigation of Environmental	Hazards	506-55-77	W83-70182	542-03-14 SJOGREN, W L.	W83-70243
505-45-01	W83-70083	RAO, D B Physical Oceanography		GRAVSAT Study	70500
PARK, Y H Spectrum and Orbit Utilization Studies		161-20-00	W83-70335	676-40-01 SLIFER, L. W	W83-70508
643-10-01 Mobile Satellite Experiment	W83-70467	Ocean Optics 161-30-00	W83-70339	Advanced Power System Technology 506-55-76	W83-70181
650-60-00	W83-70473	Polar Oceanography 161-40-00	W83-70342	SMITH, E K	
PARKE, M E Altimeter Time-Dependent Current Studies		Oceanic Research Support Activities		Propagation Studies and Measuremen 643-10-03	vs ws
161-20-07	W83-70336	161-50-00 REINMANN, J J	W83-70344	SMITH, P H	
PARKER, J A Fire Resistant Composites		Aircraft Icing Research 505-45-02	W83-70084	Atmospheres and Climate Data Mana 656-26-02	gement W83-70480
505-33-31 PARSONS, C L	W83-70023	RICHMOND, R J		SMOLAK, G R Platform Systems Operations	
Intercomparison of Dobson and	Interferometric	OTV Propulsion Performance and Plu 506-60-49	ime Characterization W83-70211	506-64-22	W83-70233
Spectrometer 673-13-00	W83-70499	RICKMAN, D L		SNYDER, C T Operational Problems Fireworthiness	and Crashworthiness
PATTON, R M		Hydrothermal Ore System Detection in Mountainous Terrain	Partially Vegetated	505-45-11	W83-70088
Human Behavior and Performance 199-20-82	W83-70427	677-41-13 RIND, D	W83-70530	SNYDER, W J RSRA Flight Research/Rotors	
PAWLIK, E V Electric Propulsion Thruster Subsystem R&T	•	Global Tropospheric Modeling of Tra		532-03-11 STAPFER, G	W83-70095
506-55-25	W83-70169	176-10-00 ROBBINS, D E	W83-70350	Thermal to Electric Energy Conversion	
PEAKE, D J Funds for Independent Research (Aeronautics	s)	In-Situ Measurements of Stratospheric	Ozone W83-70268	506-55-65 Stecher, t P	W83-70177
505-36-11 PETERSON, V L.	W83-70042	147-11-05 Robinson, P A	W83-70268	Sounding Rockets Experiments (Astro 879-11-41	nomy) W83-70552
Computational Methods and Application	ons in Fluid	Spacecraft Power Systems R & T 506-55-75	W83-70180	STEIN, I	W03-70332
Dynamics 505-31-01	W83-70001	ROSCOE, H K	1100 70 100	Advanced Electrochemical Systems 506-55-55	W83-70175
Computational and Experimental Aerotherody	namics W83-70123	Pressure Modulator Radiometer 147-12-08	W83-70272	STEPHENSON, F Chemical Propulsion R&T Interagency	Cumpart
506-51-11 PETRASH, D A	W83-70123	RUDEY, R A Burning Fundamentals & Heat Transfer		506-60-10	W83-70205
Earth-to-Orbit Propulsion Life and Performar 506-60-12	nce Technology W83-70206	505-31-42	W83-70012	STERMER, R L Solid State & Optical Device Research	n
Variable Thrust OTV Propulsion Technology		Combustors and Turbines 505-40-22	W83-70057	506-54-13	W83-70149
506-60-42 PHILPOTT, D E	W83-70210	RYAN, R S		STEWART, R W Global Tropospheric Models	
Biological Effects of Particle Radiation 199-20-72	W83-70425	Space Vehicle Structural Dynamic Ana Methods		176-10-00 STICKLE, J W	W83-70349
PHINNEY, W C	***************************************	506-53-59	W83-70146	Aviation Safety Severe Storm Hazar	
Planetary Petrology 153-02-40	W83-70299	C		505-45-03 STIEF, L. J	W83-70085
Remote Sensing 153-07-40	W83-70303	S		Upper Atmosphere Research	- Reaction Rate
Experimental Impact Cratering		SAMANICH, N. E		Measurements 147-21-00	W83-70277
153-08-40 Early Crustal Genesis	W83-70304	Rotorcraft-Operating Problems 505-42-32	W83-70066	STILWELL, D E Advanced Technological Development	General Signal and
153-09-40	W83-70306	SANDER, S P Kinetic Studies Involving CH302 H02	and IO Radicals of	Data Processing Electronics Solid State	Detectors
PICKETT, H Electronics Research and Technology		Tropospheric Importance		188-78-51 STOLARSKI, R S	W83-70393
506-54-15 PIRRAGLIA, J A	W83-70150	176-30-01 Sandler, H	W83-70351	Upper Atmosphere Research - Theore 147-31-00	tical Studies W83-70285
Dynamics of Planetary Atmospheres	14/00 70010	Operational Laboratory	W83-70406	Assessment of Ozone Perturbations	
154-20-80 POLIFKA, R W	W83-70310	Longitudinal Studies		147-51-00 SUPKIS, D E	W83-70290
Advanced Manned Vehicle Onboard Propulsi 506-60-17	ion Technology W83-70207	199-10-22 Crew Health Maintenance	W83-70408	Aircraft Fire Safety Materials Testing 505-45-17	W83-70090
POLLACK, J B		199-10-32	W83-70410	SYDNOR, R L	
Climate Modeling with Emphasis on Aerosols 146-10-04	w83-70249	Cardiovascular Deconditioning 199-20-12	W83-70413	Frequency and Timing Research 310-10-62	W83-70558
Planetary Atmospheric Composition Structu-		SANFORD, R G Mission Operations Technology			
154-10-80 POOL, S L.	W83-70308	310-40-45	W83-70573	T	
Medical Operations Longitudinal Studies 199-10-21	W83-70407	SAUER, R L Advanced Life Support Systems		TAYLOR, G R	
POWELL, L. E		199-60-11 SAUNDERS, R S	W83-70440	Blood Alterations (Influence of Space	flight on the Blood
Space Platform Specification Development 906-50-00	W83-70577	Planetary Geology		and Blood-Forming Tissues) 199-20-51	W83-70420
PRESLEY, L. L. Experimental/Theoretical Aerodynamics		151-01-70 Regional Crustal Deformation	W83-70292	TAYLOR, H A , JR	
505-31-21	W83-70007	676-10-10	W83-70506	Extended Atmospheres 154-80-80	W83-70316
Advanced Turboprop-Installation Aerodynami 535-03-11	cs W83-70121	SCHIELDGE, J P Cloud Properties from Satellite Radiance		TAYLOR, L W , JR Spacecraft Controls and Guidance	
PROBST, H B High Temperature Engine Composites		672-20-09 SCHMIDLIN, F J	W83-70492	506-57-13	W83-70185
505-33-32	W83-70024	Verification and Analysis of Satellite De-		TEREN, F Control Theory and Methodology	
PUTNAM, T W Support for Forward Swept Wing (X-29A)		146-71-00 SCHWARTZ, J	W83-70257	505-34-02 Submillimeter & Optical Processing De	W83-70031
533-02-81	W83-70111	Network Systems Technology Developm 310-20-33	nent W83-70560	506-54-12	W83-70148
_		SEKANINA, Z		TERRILE, R J Planetary Infrared Imaging	
Q		Giotto particulate Impact Analyzer (f Support	PIA) Co-Investigator	196-41-77	W83-70403
QUATTRONE, P D 4		156-03-04	W83-70322	THADDEUS, P Research in Astrophysics at the Godda	ard Institute for Space
Space Station Life Support Technology 506-64-31	W83-70239	Giotto Dust Impact Detection System (I 156-03-07	DIDSY) W83-70323	Studies and Columbia University 405-02-02	W83-70465

THALLER, L. H Electrochemical Energy Conversion and Storag		Advanced Containerless Processing Technology 179-20-55	/ W83-7035
506-55-52	W83-70174	Spherical Shell Technology Study	
THIELE, O W Climate Observations		179-20-57	W83-7035
672-40-00	W83-70494	WARDRIP, S C Precision Time and Frequency Sources	
Climate Program Support 672-50-00	W83-70496	310-10-42	W83-7055
THOMAS, D T		WASILEWSKI, P J Experimental Magnetism	
On-line Data Ingest/Staging System 506-58-19	W83-70199	153-08-50	W83-7030
THOMPSON, W E		WATER, J W Stratospheric Research Field Measuremei	nts Program
Deployable Antenna Flight Experiment 906-90-00	W83-70594	Millimeter and Submillimeter Radiometry	_
TOLIVAR, A F		147-12-06	W83-7027
Advanced Control Technology 506-57-15	W83-70186	WEISSKOPF, M C X-Ray Astronomy	
TOLSON, R H		188-46-59	W83-7038
Mathematics for Engineering and Science		WEISTROP, D Ultraviolet Detector Development	
505-31-83 Fund for Independent Research (Aeronautics)	W83-70016	188-41-24	W83-7037
505-36-13	W83-70044	WELKER, J E Geodynamics Investigations Support	
Graduate Program in Aeronautics 505-36-23	W83-70047	676-01-01	W83-7050
JIAFs Base Support		WENGER, N C	
505-36-43	W83-70048	Propulsion Instrumentation	
TOON, O B		505-31-52 Controls and Instrumentation	W83-7001
Planetary Clouds Particulates and Ices 154-30-80	W83-70311	505-40-52	W83-7006
TOTH, R A	Ctratacabaria	WHITLEY, S L	
Infrared Laboratory Spectroscopy in Support of Measurements	Stratospheric	Advanced Technology Global Resources Netw 656-44-06	ork W83-7048
147-23-08	W83-70281	WHITNEY, W M	W83-7U48
TRICHEL, M C Land Use and Techniques for Monitoring Large	Scale Change	Network Software Design Technology	W02 2052
in Biomass	_	310-40-72 WILLIAMS, J R	W83-7057
677-21-30 TROMBKA. J I	W83-70518	MPS AR&DA Support	
Cross Section Determination Cosmic	Ray Induced	179-40-62 Cloud Physics	W83-7036
Background Determination Neutron Transport C Planetary Evaluation and Dynamic Studies	alculation and	179-75-10	W83-7036
153-03-50	W83-70301	Containerless Processing 179-80-30	W83-7036
X-Ray Gamma-Ray and Neutron/Gamma-Ra Planetary Exploration	y Methods for	Bioseparation Processes	1103-7030
157-03-50	W83-70324	179-80-40 Solidification Processes	W83-7036
TRUSZKOWSKI, W F		179-80-60	W83-7036
Human-to-Machine Interface Technology 310-40-37	W83-70572	Crystal Growth Processes 179-80-70	W83-7036
TUCKER, C J		WILLIAMS, R J	W03-7U30
Monitoring Large Scale Total Primary Pro Desertification Processes with AVHRR Imagery	oduction and	Refining of Nonterrestrial Materials	W83-7013
199-30-07	W83-70429	506-53-17 Planetary Materials Laboratory and Analytical	
TURNER, D M Spacecraft System Technology		152-02-40	W83-7029
506-64-15	W83-70231	WILLOH, R G Non-Axisymmetric Nozzle Research	
TURNER, J R Teleoperator Maneuvering System		505-43-22	W83-7007
906-75-00	W83-70591	WILLSON, R C Solar Irradiance Rocket Experiment	
906-75-00	W83-70591	Solar Irradiance Rocket Experiment 672-40-08	W83-7049
906-75-00 U	W83-70591	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D	W83-7049
U	W83-70591	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38	W83-7049 W83-7056
UUNDERWOOD, J H	w83-70591	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T	
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51	W83-70591	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62	
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W		Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S	W83-7056
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51		Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80	W83-7056
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer	W83-70371	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T	W83-7056 W83-7006
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer	W83-70371	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13	W83-7056 W83-7006
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33	W83-70371	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C	W83-7056 W83-7006 W83-7031 W83-7011
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E	W83-70371	Solar Irraduance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12	W83-70371	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26	W83-7056 W83-7006 W83-7031 W83-7011
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W	W83-70371 W83-70511 W83-70229	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00	W83-70371 W83-70511 W83-70229	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows	W83-70371 W83-70511 W83-70229	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data	W83-70371 W83-70511 W83-70229 d Applications W83-70252	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation	Solar Irraduance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i W83-7051
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support	W83-7056 W83-7006 W83-7011 S Studies i W83-7051 W83-7048
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02	W83-7056 W83-7006 W83-7031 W83-7011 s Studies i W83-7051
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support	W83-7056 W83-7006 W83-7011 S Studies i W83-7051 W83-7048
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348	Solar Irraduance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32	W83-7056 W83-7006 W83-7011 S Studies i W83-7051 W83-7048
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods	W83-7056 W83-7031 W83-7011 s Studies s W83-7051 W83-7048 W83-7033 W83-7032
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperator and EVA Human Factors	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70254 Interpretation W83-70347 W83-70348 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56	W83-7056 W83-7001 W83-7011 s Studies i W83-7051 W83-7048 W83-7048
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperator and EVA Human Factors 506-57-29	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperator and EVA Human Factors 506-57-29 Teleoperators and Cryogenic Fluid Managemin 506-64-29	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eai 676-59-30	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Oevelopment of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperator and EVA Human Factors 506-57-29 Teleoperators and Cryogenic Fluid Manageme 506-64-29 WALBERG, G D	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70254 Interpretation W83-70348 W83-70348 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WJ. C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eai	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 508-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperation and EVA Human Factors 506-57-29 Teleoperations and Cryogenic Fluid Manageme 506-64-129 WALBERG, G D Entry Vehicle Aerothermodynamics 506-51-13	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70254 Interpretation W83-70348 W83-70348 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J F Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eai 676-59-30 YOUNG, R E Dynamics of Planetary Atmospheres 154-20-80	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperations and EVA Human Factors 506-57-29 Teleoperations and Cryogenic Fluid Management 506-64-29 WALBERG, G D Entry Vehicle Aerothermodynamics 506-51-13 WALIGORA, J M	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70254 Interpretation W83-70347 W83-70348 W83-70139	Solar Irraduance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eai 676-59-30 YOUNG, R E Dynamics of Planetary Atmospheres	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041 W83-70516 W83-70516 W83-7030
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperations and Cryogenic Fluid Manageme 506-51-13 VALIBORA, J M Systems Habitability Verification 199-10-41	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70254 Interpretation W83-70347 W83-70348 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eas 676-59-30 YOUNG, R E Dynamics of Planetary Atmospheres 154-20-80 YUSKA, J A	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperations and EVA Human Factors 506-57-29 Teleoperations and Cryogenic Fluid Manageme 506-64-29 WALBERG, G D Entry Vehicle Aerothermodynamics 506-51-13 WALIGORA, J M Systems Habitability Verification 199-10-41 WALLGREN, K	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348 W83-70139 W83-70139 W83-70139	Solar Irraduance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, R E Dynamics of Planetary Atmospheres 154-20-80 YUSKA, J A Engine Systems Facilities Operations 505-40-70	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041 W83-70516 W83-70516 W83-7030
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperations and Cryogenic Fluid Managemic 506-57-29 Teleoperations and Cryogenic Fluid Managemic 506-64-29 WALBERG, G D Entry Vehicle Aerothermodynamics 506-51-13 WALIGGRA, J M Systems Habitability Verification 199-10-41 WALLGREN, K MPP - Systems Software R & T	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348 W83-70139 W83-70139 W83-70139	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Gotto Ephemeris Support 156-03-02 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eai 676-59-30 YOUNG, R E Dynamics of Planetary Atmospheres 154-20-80 YUSKA, J A Engine Systems Facilities Operations	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041 W83-70516 W83-70516 W83-7030
U UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperations and Cryogenic Fluid Management 506-64-29 WALBERG, G D Entry Vehicle Aerothermodynamics 506-51-13 WALLGORA, J M Systems Habitability Verification 199-10-41 WALLGERN, K MPP - Systems Software R & T 506-54-56 WANG, T G	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348 W83-70139 W83-70139 W83-70124 W83-70124 W83-70124 W83-70159	Solar Irradiance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, L E SERIES - Satellite Emission Range Inferred Eac 676-59-30 YOUNG, R E Dynamics of Planetary Atmospheres 154-20-80 YUSKA, J A Engine Systems Facilities Operations 505-40-70	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041 W83-70516 W83-70516 W83-7030
UNDERWOOD, J H Development of Experiment and Hardware 188-38-51 URBAN, E W Superconducting Gravity Gradiometer 676-59-33 V VALGORA, M E Space Station Propulsion Requirements 506-64-12 VAUGHAN, W W Meteorological Satellite Data Research and 146-61-00 Studies of Dynamics of Atmospheric Flows 146-76-00 Development of New Remote Data Techniques 175-20-00 Remote Sensor Development 175-40-00 VENNERI, S Advanced Space Structural Concepts 506-53-40 W WAGNON, F W Teleoperations and Cryogenic Fluid Managemic 506-57-29 Teleoperations and Cryogenic Fluid Managemic 506-64-29 WALBERG, G D Entry Vehicle Aerothermodynamics 506-51-13 WALIGGRA, J M Systems Habitability Verification 199-10-41 WALLGREN, K MPP - Systems Software R & T	W83-70371 W83-70511 W83-70229 d Applications W83-70252 W83-70264 Interpretation W83-70347 W83-70348 W83-70139 W83-70139 W83-70124 W83-70124 W83-70124 W83-70159	Solar Irraduance Rocket Experiment 672-40-08 WILSON, D D Satellite Communication Technology 310-20-38 WINTUCKY, W T Engine Systems Research 505-40-62 WOLFF, R S Extended Atmospheres 154-80-80 WRIGHT, H T Structural Integration 534-03-13 WRIGLEY, R C Thematic Mapper Simulator Land Resource: Western Ecozones 677-21-26 WU, C SAR Data System Research and Development 656-44-03 Y YAMARONE, C A Research Mission Study - TOPEX 161-10-01 YEOMANS, D K Giotto Ephemeris Support 156-03-02 YOUNG, D R Bone Alterations 199-20-32 YOUNG, J P Payloads Definition Methods 506-53-56 YOUNG, R E Dynamics of Planetary Atmospheres 154-20-80 YUSKA, J A Engine Systems Facilities Operations 505-40-70	W83-7056 W83-7031 W83-7011 s Studies i W83-7051 W83-7048 W83-7032 W83-7041 W83-7041 W83-70516 W83-70516 W83-7030

W83-70059

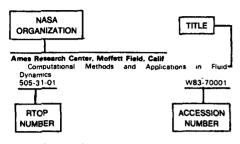
ZETKA, E F	
Multisensor Technique Development	
677-21-28	W83-70516
ZOBY, E V	
Shuttle Infrared Leeside Temperature	Sensing (SILTS)
506-63-34	W83-7022
ŻUK, J	
Rotorcraft Systems Integration	
532-06-11	W83-70096

RESPONSIBLE NASA ORGANIZATION INDEX

RTOP SUMMARY

FISCAL YEAR 1983

Typical Responsible NASA Organization Index Listing



Listings in this index are arranged alphabetically by Responsible NASA Organization. The title of the RTOP provides the user with a brief description of the subject matter. The accession number denotes the number by which the citation and the technical summary can be located within the Summary Section. The titles are arranged under each Responsible NASA Organization in ascending accession number order

Α

Arnes Research Center, Moffett Field, Calif		
Computational Methods and Application	is in	Fluid
Dynamics	14/00 7/	
505-31-01 Viscous Flows	W83-70	0001
505-31-11 Experimental/Theoretical Aerodynamics	W83-70	0004
505-31-21 Computational Flame Radiation Research	W83-70	0007
505-31-41	W83-70	0011
Test Methods and Instrumentation 505-31-51	W83-70	0013
Life Predicton Fatigue Damage and Environs in Metals and Composites	mental Ef	fects
505-33-21 Fire Resistant Composites	W83-70	0020
505-33-31	W83-70	0023
Flight Loads Analysis	14/00 7/	2020
505-33-41 Flight Control Concepts and Reliability Enhance	W83-70	JU26
505-34-01 Advanced Controls and Guidance	W83-70	0030
505-34-11 Human Factors Facilities Operations	W83-70	0033
505-35-01	W83-70	036
Flight Management Systems 505-35-21	W83-70	0038
Piloted Simulation Technology 505-35-31	W83-70	0040
Funds for Independent Research (Aeronautics) 505-36-11	W83-70	042
Aeronautics Graduate Research Program 505-36-21	W83-70	0045
Numerical Aerodynamic Computational Techni	ques W83-70	0040
505-37-01 Advanced Computational Concepts	VV03-70	1049
505-37-21 Class VI Computational Capability Support	W83-70	052
505-37-31	W83-70	0053
Rotorcraft Aeromechanics and Configurations 505-42-11	W83-70	0064
Low Speed Wind Tunnel Operations		
505-42-81 Geodynamics/Flight Dynamics of Powered	W83-70 Lift Veh	
505-43-01	W83-70	
High Performance Aircraft Flight Dynamic	cs and F	lying
Qualities 505-43-11	W83-70	070
Interagency Assistance and Testing - Dryden 505-43-31	W83-70	074
High-Speed Wind Tunnel Operations	W83-70	070
505-43-61 Hypersonic Aeronautics Technology		
505-43 81 B-578 Flight Investigation of Environmental H	W83-70	080
505-45-01	W83-70	083
Operational Problems Fireworthiness and Cra	shworth	
Rotorcraft Flight Guidance Systems Technolog	y	
532-01-11 RSRA Flight Research/Rotors	W83-70	094
532-03-11	W83-70	095
Rotorcraft Systems Integration 532-06-11	W83-70	096

Flight Experiments Support 532-07-11	W83-70099
Simulation Facilities Operations 532-08-11	W83-70100
Advanced Fighter Technology Integ (AFTI-F-111)	ration/F-111
533-02-11 Advanced Fighter Aircraft (F-15)	W83-70101
533-02-21 F-4C Spanwise Blowing Flight Investigations	W83-70102
533-02-31 Integrated Research Aircraft Control (INTERACT)	W83-70103 Technology
533-02-41 Propulsive-Lift Technology - QSRA Flight Expe 533-02-50 Powered Lift Systems Technology - Harrier Fli	W83-70106
Program 533-02-51 AFTI/F-16	W83-70107
533-02-61 Decoupler Pylon Flight Evaluation	W83-70108
533-02-71 Support for Forward Swept Wing (X-29A)	W83-70109
533-02-81 Flight Support	W83-70111
533-02-91 Highly Maneuverable Aircraft Technology Fli	W83-70113
533-03-11 Advanced Turboprop-Installation Aerodynamics	W83-70114
535-03-11 Computational and Experimental Aerotherodyn 506-51-11	
Thermo-Gasdynamic Test Complex 506-51-41	W83-70128
Surface Physics and Computational Chemistry 506-53-11	W83-70127
Thermal Protection Systems Materials a Evaluation	
506-53-31 Structures Analysis and Synthesis	W83-70136
506-53-51 Photophysics and Optical Information Processi	W83-70142 ng
506-54-11 Far Infrared Detectors and Cooled Research	W83-70147
506-54-21 Advanced Concepts for Knowledge-Based Ex 506-54-61	W83-70153 pert Systems W83-70160
Space Human Factors 506-57-21	W83-70189
Future Data Systems Concepts 506-58-11 Study of Large Deployable Reflector for I	W83-70195
Submillimeter Astronomy 506-62-21	W83-70212
Infrared Imagery of Shuttle 506-63-35	W83-70222
OEX Thermal Protection Experiments 506-63-36	W83-70223
Space Shuttle Orbiter Flying Qualities Criteria 506-63-40	(OEX) W83-70226
Space Station Life Support Technology 506-64-31	W83-70239
Climate Modeling with Emphasis on Aerosols 146-10-04	W83-70249
Tropospheric Air Quality - Technology Develop 146-20-10 Atmospheric Processes Experiments and Syste	W83-70250
147-10-03 Quantitative Infrared Spectroscopy of Minor Co	W83-70265
the Earth's Stratosphere	W83-70276
Stratospheric Research 147-30-02	W83-70284
Studies of the Distribution of Elements and M Among Meteorites	
152-03-60 Formation Evolution and Stability of Proto-	
153-01-60 Planetary Atmospheric Composition Structure 154-10-80	
Dynamics of Planetary Atmospheres 154-20-80	W83-70308
Planetary Clouds Particulates and Ices 154-30-80	W83-70303
VEGA Balloon Nephelometer Design 157-04-80	W83-70327
Theoretical Studies of Galaxies Active Galactic Quasi Stellar Objects	
188-41-53 Planetary Astronomy and Supporting Laborat	
196-41-67 Detection of Other Planetary Systems	W83-70397
196-41-68 Operational Laboratory 199-10-12	W83-70398 W83-70406
Longitudinal Studies 199-10-22	W83-70408
Crew Health Maintenance	W83-70406
Cardiovascular Deconditioning 199-20-12	W83-70413
	•

Basic Mechanisms Underlying Space Motion S 199-20-22	ickness W83-70415
Bone Alterations 199-20-32	W83-70417
Muscle Atrophy 199-20-42	W83-70419
Blood Alterations 199-20-52	W83-70421
Fluid and Electrolyte Changes 199-20-62	W83-70423
Biological Effects of Particle Radiation 199-20-72	W83-70425
Human Behavior and Performance 199-20-82	W83-70427
General biomedical Research	
199-20-92 Developmental Biology	W83-70428
199-40-22 Biological Adaptation	W83-70432
199-40-32 Chemical Evolution	W83-70433
199-50-12 Organic Geochemistry	W83-70434
199-50-22 Origin and Evolution of Life	W83-70435
199-50-32 Solar System Environments	W83-70436
199-50-42 Life in the Universe	W83-70437
199-50-52 The Search for Extraterrestrial Intelligence	W83-70438
199-50-62	W83-70439
Advanced Life Support Systems 199-60-12	W83-70441
Advanced Extravehicular Systems 199-60-22	W83-70443
Food Requirements Production and Processir 199-60-42	ng for CELSS W83 70444
Waste Management for CELSS 199-60-52	W83-70445
Systems Management Control and Ecological C for CELSS	onsiderations
199-60-62 Cosmos Flight Experiments Project	W83-70446
199-70-12 Sample Bank	W83-70448
199-70-32 Vestibular Research Facility (VRF)/Variable Gra-	W83-70449
Facility (VGRF) 199-80-32	W83-70451
Long Duration Life Sciences Satellite Progra 199-80-42	
Large Primate Facility 199-80-52	W83-70454
Mammalian Development Facility 199-80-62	W83-70455
Arnes Research Center Initiatives	
199-90-72 Applications Experiments Program Support	W83 70457
646-41-02 Thematic Mapper Simulator Land Resource	W83-70472 s Studies in
Western Ecozones 677-21-26	W83 70515
Remote Sensing Techniques for Geobotanical D of Chromium-Bearing Rock Types	iscrimination
677-42-05 Digital Mapping of Irrigated Cropland	W83-70537
677-60-11 Remote Sensing Applications for Facility Site S	W83-70547 Selection and
Waste Disposal Impact Assessment 677-60-15	W83-70548
Use of Thematic Mapper Data for Electransmission Corridor Analysis and Siting	
677-60-19	W83-70549
G	
Goddard Inst. for Space Studies, New York	
Research in Astrophysics at the Goddard Institution Studies and Columbia University	ute for Space
405-02-02 Goddard Space Flight Center, Greenbelt, Md	W83-70465
Research Airport Operation 534-04-16	W83-70119
Electrically Conductive Thermal Control Coating	

677-60-19	W83-70549
G	
Goddard Inst for Space Studies, New York	
Research in Astrophysics at the Goddard I	nstitute for Space
Studies and Columbia University	
405-02-02	W83-70465
Goddard Space Flight Center, Greenbelt, Md Research Airport Operation	
534-04-16	W83-70119
Electrically Conductive Thermal Control Co	
506-53-26	W83-70133
Payloads Definition Methods	
506-53-56	W83-70145
Acousto-Optic & Submillimeter Device Tec	hnology
506-54-16	W83-70151
Sensor Research and Technology	
506-54-26	W83-70156
MPP - Systems Software R & T	
506-54-56	W83-70159
Automation Research and Technology for N	ear-Earth Mission
Operations	
506-54-66	W83-70163
Advanced Power System Technology	
506-55-76	W83-70181
Data Systems Research and Technology	
506-58-16	W83-70198
300-30-10	*****************

,	,
Communications TDRSS Follow-On/Inter 506-58-26 Dynamic Acoustic and Thermal Environm	W83-70203
Experiment (Transportation Technology Ver Program)	ificationOEX
506-63-39 In-Space Fluid Management Technology - Goo 506-64-26	W83-70225 Idard Support W83-70236
Meteorological Satellite Data Research 146-60-00	W83-70251
Global Weather Experiment Data Processing 146-64-00	
Meteorological Parameter Extraction 146-65-00	W83-70254
Meteorological Observing System Developmer 146-70-00 Verification and Analysis of Satellite Derived F	W83-70256
146-71-00 Upper Atmosphere Research - Field Measurem	W83-70257
147-11-00 Upper Atmosphere Research - Field Measuren	W83-70266 nents
147-12-00 Solar Flux in Upper Atmosphere 147-15-00	W83-70269
Upper Atmosphere Research - Rea Measurements	W83-70273 action Rate
	W83-70277 feasurements
147-23-00 Upper Atmosphere Research - Theoretical Stur 147-31-00	W83-70280 dies W83-70285
General Circulation Modeling of the Stratosphe 147-32-00	
Upper Atmosphere Research - Satellite Data A	W83-70287
Critical Examination of Upper Stratospheric N 147-43-00 Spectroscopic Properties of the Stratosphere	w83-70288
147-44-00 Assessment of Ozone Perturbations	W83-70289
147-51-00 Cross Section Determination Cosmic F Background Determination Neutron Transport Ca	W83-70290 Ray Induced
Planetary Evaluation and Dynamic Studies 153-03-50	W83-70301
Experimental Magnetism 153-08-50 Dynamics of Planetary Atmospheres	W83-70305
154-20-80 Atomic and Molecular Properties of Planetary	W83-70310 Atmospheric
Constituents 154-50-80 Planetary Aeronomy Theory and Analysis	w83-70313
Planetary Aeronomy Theory and Analysis 154-60-80 Cosmic Chemistry Aeronomy Comets Grains	W83-70314
154-75-80 Extended Atmospheres	W83-70315
154-80-80 X-Ray Gamma-Ray and Neutron/Gamma-Ray Planetary Exploration	W83-70316 Methods for
157-03-50 Improvements in Neutral and Ion Mass Spectro 157-04-80	W83-70324 ometry W83-70326
Planetary Instrument Development Program Astronomy	m/Planetary
157-05-50 Ocean Advanced Studies 161-10-00	W83-70328 W83-70332
Physical Oceanography 161-20-00	W83-70332 W83-70335
Ocean Optics 161-30-00	w83-70339
Polar Oceanography 161-40-00 Oceanic Research Support Activities	W83-70342
161-50-00 Severe Storms and Local Weather Research	W83-70344
175-13-00 Global Tropospheric Models 176-10-00	W83-70346 W83-70349
Global Tropospheric Modeling of Trace Gas 176-10-00	S Distribution W83-70350
Development of Solar Experiments and Hardwa 188-38-51	are W83-70372
Ground-Based Observations of the Sun 188-38-52 Experiment Development - Laboratory and Their	W83-70374 oretical Solar
Physics 188-38-53	W83-70376
Ultraviolet Detector Development 188-41-24 UV and Optical Astronomy	w83-70379
188-41-51 Infrared and Sub-Millimeter Astronomy	W83-70380
Particle Astrophysics and Experiment Defin 188-46-56	W83-70382 hition Studies W83-70383
Gamma Ray Astronomy 188-46-57 X-Ray Astronomy	W83-70386
X-Hay Astronomy 188-46-59 Advanced Technological Development General	W83-70387 I Signal and
Data Processing Electronics Solid State Detector 188-78-51	s W83-70393
Ground-Based Infrared Astronomy 196-41-50 Imaging Studies of Comets	W83-70394
196-41-52 Advanced Infrared Astronomy and Laboratory	
196-41-54	W83-70396

Monitoring Large Scale Total Primary Pro	duction and
Desertification Processes with AVHRR Imagery 199-30-07	W83-70429
Solar Physics Data Analysis and Operations 385-38-01	W83-70460
Data Analysis Astronomy 385-41-01	W83-70463
High Energy Astrophysics Data Analysis 385-46-01	W83-70464
Atmospheres and Climate Data Management	
656-26-02 Information Sciences Research and Developm	
656-30-01 Transportable Applications Executive (TAE)	W83-70481
656-44-10 Improved On-Line Availability of Data	W83-70486
656-50-01	W83-70487
Advanced Technology Image Digitization 656-60-10	W83-70488
Sciences Directorate Local Area Computer Ne 656-85-01	twork W83-70490
General Ground Support Equipment (GS Technology Extension	E) Software
656-90-01 Global Climate Model Development and Appli	W83-70491
672-30-00	W83-70493
Climate Observations 672-40-00	W83-70494
Climate Program Support 672-50-00	W83-70496
DASIBI Measurement of Ozone I Column-Content	Profile and
673-11-00	W83-70498
Spectrometer	W83-70499
673-13-00 Aircraft Borne LIDAR for O3 and OH Measure	ments
673-14-00 Absolute Solar Flux and Variability	W83-70500
673-15-00 Correlative Measurement Improvements	W83-70501
673-18-00 Investigation of Upper Atmosphere Dynamics w	W83-70502 oth Nimbus-7
Satellite Data 673-31-00	W83-70503
Variability and Trends in Stratospheric Ozono Atmosphere and UV Solar Flux Variations	
673-41-00 Geodynamics Investigations Support	W83-70504
676-01-01	W83-70505
Geopotential Research Mission (GRM) GRAVS Studies	
676-59-10 Renewable Resources Field Research and Sp	W83-70509 acecraft Data
Analysis 677-21-24	W83-70513
Hydrologic Information Extraction Technique 677-22-27	Development W83-70519
Multispectral Linear Array for Remote Sensing 677-27-01	W83-70520
Soil/Snow Moisture Research and Assessi Study	
677-29-05	W83-70521
Long Wavelength Subsurface Sounder 677-29-23	W83-70528
Geobotanical Mapping in the Eastern United S 677-42-07	W83-70538
Crustal Magnetic Field Representation and Ver 677-45-06	ification W83-70542
Sounding Rocket Experiments 879-11-38	W83-70551
Sounding Rockets Experiments (Astronomy) 879-11-41	W83-70552
Sounding Rocket Experiments (High Energy 879-11-46	
Software Technology	
310-10-23 Attitude/Orbit Technology	W83-70554
310-10-26 Precision Time and Frequency Sources	W83-70555
310-10-42 Network Systems Technology Development	W83-70556
310-20-33 Satellite Communication Technology	W83-70560
310-20-38	W83-70561
Very Long Baseline Interferometry (VLBI) Tracking and Data Relay Satellite (TDRS)	
310-20-39 Advanced Space Systems for Users of NA	
310-20-46 Operations Support Computing Technology	W83-70563
310-40-26	W83-70571
Human-to-Machine Interface Technology 310-40-37	W83-70572
Mission Operations Technology 310-40-45	w83-70573
Image Processing Technology 310-40-46	W83-70574
Systems Management Technology 310-40-49	W83-70575
	: ••••
J	
et Propuleion Leboratory Pasadana Calif	

et Propulsion Laboratory	. Pasad	ena, Ca	dıf	
Boundary-Layer Stabil	ity and	Transitio	n Resear	ch
505-31-15	•			W83-70006
Clear Air Turbulence	Studies	Using	Passive	Microwave
Radiometers		-		
505-45-05				W83-70086

A composition of the first Market Composition
Aviation Safety Technology - Applied Fluid Mechanics/Fire Materials Modeling 505-45-15 W83-70089
Fundamentals of Mechanical Behavior of Composite Matrices 506-53-15 W83-70129
Effects of Space Environment on Composites 506-53-25 W83-70132
Advanced Space Structures Antenna Technology Development
506-53-45 W83-70141 Space Vehicle Dynamics Methodology
506-53-55 W83-70144 Electronics Research and Technology
506-54-15 W83-70150 Acytive and Passive Sensor Research
506-54-25 W83-70155 Automation Technology for Planning Teleoperation and
Robotics 506-54-65 W83-70162
Technology of Advanced Concepts 506-55-15 Flectric Propulsion Thruster Subsystem R&T W83-70167
506-55-25 W83-70169 High Performance Solar Array Research and Technology 506-55-45 W83-70172
Advanced Electrochemical Systems 506-55-55 W83-70175
Thermal to Electric Energy Conversion Technology 506-55-65 W83-70177
Spacecraft Power Systems R & T 506-55-75 W83-70180
Advanced Control Technology 506-57-15 W83-70186 Teleoperator Human Interface Technology
506-57-25 W83-70191 Data Systems Research and Technology
506-58-15 W83-70197 Deep Space and Advanced COMSAT Communications
Technology 506-58-25 W83-70202 Advanced Low Thrust Chemical Propulsion Technology
Advanced Low Thrust Chemical Propulsion Technology 506-60-25 W83-70209 Planetary Aerocapture Systems Research and Technology Development
506-62-25 W83-70214 Spacecraft System Technology
506-64-15 W83-70231 Advanced Thermal Control Technology for Croyogenic
Propellant Storage 506-64-25 W83-70235 Development of a Shuttle Flight Experiment Drop Dynamics
Module 542-03-01 W83-70241
Space Calibration of Solar Cells 542-03-20 W83-70244
Numerical Analysis of Remote Sensing Data 146-66-01 W83-70255 Global Weather Research - Microwave Pressure Sounder
146-72-01 W83-70258 Global Weather Research - Advanced Moisture and
Temperature Sounder (AMTS) 146-72-02 W83-70259
Tropospheric Wind Measurement Assessment 146-72-04 W83-70260 Advanced Microwave Sensing of Meteorological
Parameters 146-72-05 W83-70261
Stratospheric Research Balloon Laser In-Situ Sensor 147-11-04 W83-70267
Stratospheric Fourier Spectroscopy at Near and Mid IR Wavelengths
147-12-05 WB3-70270 Stratospheric Research Field Measurements Program Millimeter and Submillimeter Radiometry
147-12-06 W83-70271 Pressure Modulator Radiometer
147-12-08 W83-70272 Multi-Sensor Balloon Measurements
147-16-01 W83-70274 Gas Correlation Wind Sensor
147-18-02 W83-70275 Chemical Kinetics of the Upper Atmosphere 147-21-03 W83-70278
Photochemistry of the Upper Atmosphere 147-22-01 W83-70279
Infrared Laboratory Spectroscopy in Support of Stratospheric Measurements
147-23-08 W83-70281 Laser Laboratory Spectroscopy
147-23-09 W83-70282 Millimeter/Submillimeter Laboratory Spectroscopy 147-23-10 W83-70283
Data Survey and Evaluation 147-51-02 W83-70291
Planetary Geology 151-01-70 W83-70292
JPL Petrology Support 153-02-70 W83-70300
Remote Sensing of Atmospheric Structure 154-40-80 W83-70312 Extended Atmospheres
154-80-80 W83-70317 International Halley Watch
156-02-02 W83-70318 Giotto Halley Modeling
156-03-01 W83-70319 Glotto Ephemeris Support
156-03-02 W83-70320 Giotto Ion Mass Spectrometer Co-Investigator Support 156-03-03 W83-70321

Giotto particulate Impact Analyzer (PIA) Co	-Investigator	Digital Topographic Mapping	Mission	JSC General Operations Support - Planetary	
Support	W82 70222	Requirements/Feasibility Study	W83-70523	152-05-40	W83-70297
156-03-04 Giotto Dust Impact Detection System (DIDS)	W83-70322	677-29-12 Space Station Resource Observations Paylog		Planetary Petrology 153-02-40	W83-70299
156-03-07	W83-70323	677-29-14	W83-70524	Manned Lunar Base Study	
Infrared Experiment Development 157-04-80	W83-70325	Attitude Tracker Feasibility Study		153-06-40 Remote Sensing	W83-70302
Planetary Instrument Definition	1103-70323	677-29-17	W83-70525	153-07-40	W83-70303
157-20-70	W83-70329	Advanced Radar Concepts and Systems Stu 677-29-18	w83-70526	Experimental Impact Cratering	
Research Mission Study - TOPEX 161-10-01	W83-70333	Luminescence Detector from Space		153-08-40 Early Crustal Genesis	W83-70304
Advanced Earth Orbiter Radio Metric		677-29-22	W83-70527	153-09-40	W83-70306
Development		Improved Rock Type Discrimination		JSC General Operations - Geophysics & Ger	
161-10-03	W83-70334	677-41-03 High Spectral Resolution Techniques for Ge	W83-70529	153-10-40	W83-70307
Altimeter Time-Dependent Current Studies 161-20-07	W83-70336	677-41-14	W83-70531	Bioprocessing Studies 179-13-72	W83-70354
Gulf of Mexico Circulation Studies		Oil and Gas Test Case Study		Inflight Medical Support	
161-20-10	W83-70337	677-41-16 Chromite Test Case Study	W83-70532	199-10-00	W83-70404
Time Dependent Fields 161-20-11	W83-70338	677-41-17	W83-70533	Operational Laboratory Support 199-10 11	W83-70405
Ocean Applications Development Program		SMIRR Data Analysis		Medical Operations Longitudinal Studies	
161-30-01 Lidar and Acoustics Applications to Ocea	W83-70340	677-41-19 Geological Applications of New Re	W83-70534 mote Sensing	199-10-21 Crew Health Maintenance	W83-70407
161-30-05	W83-70341	Techniques	note delibing	199-10-31	W83-70409
Coupled Active-Passive Sea Ice Analysis		677-41-23	W83-70535	Systems Habitability Verification	_
161-40-02 Ocean Processes Branch Scientific Program 5	W83-70343	Use of SAR for Geologic Mapping 677-43-16	W83-70539	199-10-41 Cardiovascular Deconditioning (JSC)	W83-70411
161-50-02	W83-70345	Topographic Mapping Methods		199-20-11	W83-70412
Kinetic Studies Involving CH302 HO2 and		677-43-17	W83-70540	Space Motion Sickness	
Tropospheric Importance	W83-70351	SIR-A Data Analysis 677-43-18	W83-70541	199-20-21 Bone Loss	W83-70414
176-30-01 Development of Resonant Ionization Laser Sp		New Techniques for Quantitative Analysis	of SAR Images	199-20-31	W83-70416
Tropospheric NOx Measurements		677-46-02	W83-70543	Muscle Alterations	
176-40-03 Glass Research	W83-70352	Airborne Radar Operations 677-47-03	W83-70544	199-20 41 Blood Alterations (Influence of Space flight	W83-70418
179-11-20	W83-70353	ER SEASAT Digital SAR Processing	***************************************	and Blood-Forming Tissues)	it on the blood
Multimode Acoustic Research		677-48-01	W83-70545	199-20-51	W83-70420
179-15-20 Advanced Containerless Processing Technological	W83-70355	Spatial Radar Image Registration 677-48-03	W83-70548	Fluid and Electrolyte Change 199-20-61	W83-70422
179-20-55	w83-70356	IPL Upgrade Interactive Display/Virtual Ro		Radiation Effects and Protection	W03-70422
Electrostatic Containerless Processing Techno	ology	677-80-22	W83-70550	199-20-71	W83-70424
179-20-56	W83-70357	Radio Metric Technology Development 310-10-60	W83-70557	Global Ecology 199-30-31	W83-70430
Spherical Shell Technology Study 179-20-57	W83-70358	Frequency and Timing Research		Advanced Life Support Systems	***************************************
Extraterrestrial Materials Processing		310-10-62	W83-70558	199-60-11	W83-70440
179-40-62	W83-70359	Space Systems and Navigation Technology 310-10-63	W83-70559	Advanced Extravehicular Systems (Space Si	uit) W83-70442
Research of the use of Space Resources 179-46-20	W83-70361	X-Band Uplink Development	***************************************	199-60-21 Man-Machine Engineering Requirements	
Development of Experiment and Hardware		310-20-64	W83-70564	Functional Interfaces	
188-38-51	W83-70371	Antenna Systems Development 310-20-65	W83-70565	199-60-71	W83-70447
Gravitational Wave Astronomy and Cosmolog 188-41-22	y W83-70378	Radio Systems Development	***************************************	Advanced Equipment Development 199-80-31	W83-70450
Gamma-Ray Astronomy		310-20-66	W83-70566	Interdisciplinary Research	
188-46-57	W83-70385	Communications Systems Technology Devel 310-20-67	opment W83-70567	199-90-71	W83-70456
X-Ray Astronomy CCD Instrumentation Deve 188-46-59	W83-70389	Station Monitor and Control Technology	1103-70307	Land Use and Techniques for Monitoring Larg in Biomass	ge Scale Change
STARPROBE - Advanced Technology M		310-20-68	W83-70568	677-21-30	W83-70518
	runagement a			077-21-00	
Planning	_	Network Monitor and Control Technology		Manned Facilities	
Planning 188-78-38	W83-70390		W83-70569	Manned Facilities 906-54-00	W83-70578
Planning	_	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70		Manned Facilities	
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy	W83-70390 W83-70399	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology	W83-70569 W83-70570	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services	W83-70578 W83-70583
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73	W83-70390	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70	W83-70569	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00	W83-70578
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy	W83-70390 W83-70399	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology	W83-70569 W83-70570	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services	W83-70578 W83-70583
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids	W83-70390 W83-70399 W83-70400 W83-70401	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology	W83-70569 W83-70570	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts	W83-70578 W83-70583 W83-70592
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76	W83-70390 W83-70399 W83-70400	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72	W83-70569 W83-70570 W83-70576	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00	W83-70578 W83-70583 W83-70592
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70403	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72	W83-70569 W83-70570 W83-70576	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts	W83-70578 W83-70583 W83-70592
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70403	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Te Aircraft Fire Safety Materials Testing 505-45-17	W83-70569 W83-70570 W83-70576	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach,	W83-70578 W83-70583 W83-70592 W83-70593
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyset 385-38-01	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70403	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, To Aircraft Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials	W83-70569 W83-70570 W83-70576	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on	W83-70578 W83-70583 W83-70592 W83-70593
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70403	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Te Aircraft Fire Safety Materials Testing 505-45-17	W83-70569 W83-70576 W83-70576	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20	W83-70578 W83-70593 W83-70593 Fia W83-70584
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 38-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70403	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toward Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27	W83-70569 W83-70576 W83-70576	Manned Facilities 906-54-00 Advanced Transportation 908-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations	W83-70578 W83-70593 W83-70593 Fia W83-70584 stems Ground
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 s W83-70461 rechniques to W83-70462	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Telegraphy Americal Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels	W83-70579 W83-70576 W83-70576 W83-70090 W83-70130 posite Materials W83-70134	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21	W83-70578 W83-70593 W83-70593 Fia W83-70584 stems Ground W83-70585
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 38-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 W83-70461 Techniques to W83-70462 W83-70467	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toward Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27	W83-70569 W83-70576 W83-70576 W83-70090 W83-70130 posite Materials	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F	W83-70578 W83-70593 W83-70593 Fia W83-70584 stems Ground W83-70585
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-76 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application	W83-70390 W83-70400 W83-70401 W83-70402 W83-70403 s W83-70461 fechniques to W83-70462 W83-70467 n Notification	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Teaurcraft Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17	W83-70579 W83-70576 W83-70576 W83-70090 W83-70130 posite Materials W83-70134	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F	W83-70593 W83-70593 W83-70593 Fila W83-70584 stems Ground W83-70585 Follow on Study
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-410-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 W83-70461 Techniques to W83-70462 W83-70467	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Tohan Control of the Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Tohan Control of the Software Design Technology 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-37 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology	W83-70569 W83-70576 W83-70576 W83-70090 W83-70130 posite Materials W83-70134 W83-70138 W83-70152	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 follow on Study W83-70586 Special Flight
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03	W83-70390 W83-70400 W83-70401 W83-70402 W83-70403 s W83-70461 fechniques to W83-70462 W83-70467 n Notification	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Teaurcraft Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17	W83-70569 W83-70576 W83-70576 W83-70090 W83-70130 posite Materials W83-70134 W83-70138 W83-70157 Systems	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 rolllow on Study W83-70586 Special Flight W83-70587
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Fechniques to W83-70462 W83-70467 on Notification W83-70469 W83-70470	Network Montor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Toward Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-37 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67	W83-70579 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 rolllow on Study W83-70586 Special Flight W83-70587
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 550-60-00	W83-70399 W83-70400 W83-70401 W83-70402 W83-70461 fechniques to W83-70462 W83-70467 on Notification W83-70469	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-17 Automations Technology for Manned Space 506-54-67 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems	W83-70569 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164	Manned Facilities 906-54-00 Advanced Transportation 908-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations	W83-70583 W83-70593 W83-70593 Fla W83-70584 stems Ground W83-70585 follow on Study W83-70586 Special Flight W83-70587 Study
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Fechniques to W83-70462 W83-70467 on Notification W83-70469 W83-70470	Network Montor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Toward Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-37 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67	W83-70569 W83-70576 W83-70576 W83-70190 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70176	Manned Facilities 906-54-00 Advanced Transportation 908-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations	W83-70583 W83-70593 W83-70593 Fla W83-70584 stems Ground W83-70585 follow on Study W83-70586 Special Flight W83-70587 Study
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Techniques to W83-70467 on Notification W83-70469 W83-70470 W83-70470 W83-70479 nt	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Tohan Control of the Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Tohan Control of the Software Center, Houston, Tohan Center of Control of Software Center, Houston, Tohan Control of Control	W83-70569 W83-70576 W83-70576 W83-70090 W83-70130 posite Materials W83-70134 W83-70138 W83-70155 Systems W83-70164 W83-70176 ystems W83-70176 ystems W83-70176 ystems W83-70176	Manned Facilities 906-54-00 Advanced Transportation 908-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations	W83-70583 W83-70593 W83-70593 Fla W83-70584 stems Ground W83-70585 follow on Study W83-70586 Special Flight W83-70587 Study
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 S W83-70461 Fechniques to W83-70462 W83-70467 on Notification W83-70479 W83-70479 W83-70479 W83-70482	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Toward Free Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-57 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 STS Control and Guidance Technology Deve	W83-70569 W83-70576 W83-70576 W83-70190 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70182 lopment	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24	W83-70583 W83-70593 W83-70593 File W83-70584 sterns Ground W83-70585 volume on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-77 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing Tayloromoreal Imagery 385-38-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Techniques to W83-70462 W83-70467 on Notification W83-70469 W83-70470 W83-70473 W83-70479 nt W83-70482	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Tohan Control of the Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Tohan Control of the Software Center, Houston, Tohan Center of Control of Software Center, Houston, Tohan Control of Control	W83-70569 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70182 lopment W83-70187	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic	W83-70583 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 S W83-70461 Fechniques to W83-70462 W83-70467 on Notification W83-70479 W83-70479 W83-70479 W83-70482	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-17 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-77 Therman Management for On-Orbit Energy 506-55-77 TS Control and Guidance Technology Deve 506-57-17 Human Factors for Crew Interfaces in Space 506-57-27	W83-70569 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70182 lopment W83-70187	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24	W83-70583 W83-70593 W83-70593 File W83-70584 sterns Ground W83-70585 volume on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-31-02 SAR Data System Research and Developmer	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Techniques to W83-70462 W83-70467 on Notification W83-70469 W83-70470 W83-70473 W83-70479 nt W83-70482	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Tohan Space Senter, Houston, Tohan Space Senter, Houston, Tohan Space Senter, Houston, Tohan Space Senter, Houston, Tohan Space S	W83-70569 W83-70576 W83-70576 W83-70190 W83-70130 posite Materials W83-70134 W83-70138 W83-70155 Systems W83-70164 W83-70176 systems W83-70182 lopment W83-70187	Manned Facilities 906-54-00 Advanced Transportation 908-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13	W83-70583 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-40-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Techniques to W83-70462 W83-70467 On Notification W83-70470 W83-70470 W83-70479 on W83-70479 on W83-70482 on W83-70482 on W83-70484 W83-70489	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Toher Selection of Selection o	W83-70569 W83-70576 W83-70576 W83-70190 W83-70130 posite Materials W83-70134 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70182 lopment W83-70187 W83-70187 W83-70187	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics	W83-70583 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-68-0-01 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances 672-20-09	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 S W83-70461 Sechniques to W83-70467 Son Notification W83-70469 W83-70470 W83-70473 W83-70479 Int W83-70482 W83-70484	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Space Spa	W83-70569 W83-70576 W83-70576 W83-70190 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70187 iw83-70187 iw83-70187 iw83-70192 W83-70204 uson Technology W83-70204	Manned Facilities 906-54-00 Advanced Transportation 908-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13	W83-70583 W83-70593 W83-70593 File W83-70584 sterms Ground W83-70585 Follow on Study W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Development 656-40-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Techniques to W83-70462 W83-70467 On Notification W83-70470 W83-70470 W83-70479 on W83-70479 on W83-70482 on W83-70482 on W83-70484 W83-70489	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Technology 505-45-17 Refining of Nonterrestrial Materials 566-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-77 Thermal Management for On-Orbit Energy So6-55-77 STS Control and Guidance Technology Deve 506-57-27 Space Station Communication Technology 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-60-17 Automation of Space Transportation System	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 lopment W83-70187 W83-70187 W83-70187 W83-70192 W83-70204 unn Technology W83-70207	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics 505-31-23 Aeroacoustics Research 505-31-33	W83-70583 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-75 Asteroids 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-38-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 Second of the control of the co	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toward Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-57-27 Space Station Communication Technology 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-63-27 Advanced Manned Vehicle Onboard Propuls 506-63-27 Automation of Space Transportation System 506-63-27 OEX (Orbiter Experiments) Project Support	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 lopment W83-70187 W83-70187 W83-70187 W83-70192 W83-70204 uson Technology W83-70207 S W83-70207	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamics 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental / Applied Aerodynamics 505-31-33 Aeroacoustics Research 505-31-33 Experimental Test Techniques	W83-70578 W83-70593 W83-70593 File W83-70584 sterms Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-44-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06	W83-70399 W83-70400 W83-70401 W83-70402 W83-70403 S W83-70461 Techniques to W83-70467 On Notification W83-70469 W83-70470 W83-70470 W83-70479 Int W83-70482 V83-70484 W83-70489 W83-70489	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Service S	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 lopment W83-70187 W83-70187 W83-70187 W83-70192 W83-70204 unn Technology W83-70207	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics 505-31-23 Aeroacoustics Research 505-31-33	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-02 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 550-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 556-31-02 SAR Data System Research and Developmer 656-44-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Fechniques to W83-70462 W83-70469 W83-70479 mt W83-70479 mt W83-70489 W83-70489 W83-70489 W83-70492 W83-70495 W83-70497	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toward Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-57-27 Space Station Communication Technology 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-63-27 Advanced Manned Vehicle Onboard Propuls 506-63-27 Automation of Space Transportation System 506-63-27 OEX (Orbiter Experiments) Project Support	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70182 lopment W83-70187 ** W83-70192 W83-70192 W83-70204 sion Technology W83-70207 s W83-70217 W83-70217	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics 505-31-33 Experimental Test Techniques 505-31-33 Mathematics for Engineering and Science 505-31-83 Mathematics for Engineering and Science	W83-70578 W83-70593 W83-70593 File W83-70584 sterms Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70587 Study W83-70588
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-75 Asteroids 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing Taptonomical Imagery 385-38-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation 676-10-10	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 Second of the control of the co	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Space Station Space S	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70187 ** W83-70187 ** W83-70192 W83-70192 W83-70207 ** W83-70217 W83-70219 W83-70219	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental Applied Aerodynamics 505-31-33 Experimental Test Techniques 505-31-33 Mathematics for Engineering and Science 505-31-83 Advanced Structural Alloys	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70588 Second Flight W83-70588 Second Flight W83-70588 W83-70003 W83-70005 W83-70006 W83-70016
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-02 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 550-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 556-31-02 SAR Data System Research and Developmer 656-44-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Fechniques to W83-70462 W83-70469 W83-70479 mt W83-70479 mt W83-70489 W83-70489 W83-70489 W83-70492 W83-70495 W83-70497	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Technology 505-45-17 Refining of Nonterrestrial Materials 560-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-27 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-57 Thermal Management for On-Orbit Energy 506-58-77 STS Control and Guidance Technology Deve 506-57-27 Space Station Communication Technology 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-63-27 OEX (Orbiter Experiments) Project Support 506-63-42 Space Station Operations 506-64-27	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 lopment W83-70187 W83-70187 W83-70207 W83-70207 S W83-70207 W83-70217 W83-70217 W83-70227	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental /Applied Aerodynamics 505-31-33 Experimental Test Techniques 505-31-33 Mathematics for Engineering and Science 505-31-83 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70586 Special Flight W83-70587 Study W83-70588 W83-70003 W83-70005 W83-70008 W83-70010 W83-70015
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 656-10-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-31-02 SAR Data System Research and Developmer 656-30-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Regional Crustal Deformation 676-10-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study	W83-70390 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Techniques to W83-70467 On Notification W83-70470 W83-70470 W83-70473 W83-70479 Int W83-70482 V83-70484 W83-70489 W83-70495 W83-70497 W83-70497 W83-70506	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Space Station Space S	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70176 ystems W83-70182 lopment W83-70187 W83-70192 W83-70207 S W83-70207 S W83-70207 S W83-70217 W83-70227 W83-70227	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental / Applied Aerodynamics 505-31-33 Aeroacoustics Research 505-31-33 Aeroacoustics Research 505-31-33 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-13 Life Prediction for Structural Materials 505-33-23	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70588 Second Flight W83-70588 Second Flight W83-70588 W83-70003 W83-70005 W83-70006 W83-70016
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-13-40 Digital Image Recovery and Data Manageme 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation 676-10-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01	W83-70390 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Techniques to W83-70467 Notification W83-70470 W83-70479 N83-70479 N83-70482 N83-70489 W83-70489 W83-70495 W83-70495 W83-70506 W83-70506 W83-70507	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Toher Selection of Space Selection of Space Center, Houston, Toher Selection of Space Selection of Communication of Space Selection of Space Selection of Space Selection of Space Selection of Space Space Selection of Space Space Selection of Space Space Selection of Space Space Space Selection of Space	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70187 W83-70187 W83-70187 W83-70207 S W83-70207 S W83-70207 S W83-70217 W83-70227 W83-70227 W83-70227	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Viscous Drag Reduction and Control 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics 505-31-33 Aeroacoustics Research 505-31-33 Aeroacoustics Research 505-31-33 Mathematics for Engineering and Science 505-31-33 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-23 Composites for Airframe Structures	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70587 Study W83-70588 W83-70003 W83-70005 W83-70008 W83-70010 W83-70015 W83-70016 W83-70019 W83-70019
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing Taylonomical Imagery 385-38-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-60-00 Coganic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Chimate Research Program Support 672-50-06 Regional Crustal Deformation 676-10-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01 SERIES - Satellite Emission Range Inferred E	W83-70390 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Techniques to W83-70467 Notification W83-70470 W83-70479 N83-70479 N83-70482 N83-70489 W83-70489 W83-70495 W83-70495 W83-70506 W83-70506 W83-70507	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Space Station Space S	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70134 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 lopment W83-70187 is W83-70187 is W83-70207 s W83-70207 s W83-70217 W83-70217 W83-70227 w83-70227	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental /Applied Aerodynamics 505-31-33 Experimental Test Techniques 505-31-33 Mathematics for Engineering and Science 505-31-83 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-32 Composites for Airframe Structures	W83-70583 W83-70593 W83-70593 File W83-70584 sterms Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70588 Secolomy W83-70588 W83-70588 W83-70003 W83-70005 W83-70006 W83-70016 W83-70016 W83-70019
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-31-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-31-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Cimate Research Program Support 676-50-06 Regional Crustal Deformation 676-10-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01 SERIES - Satellite Emission Range Inferred E	W83-70399 W83-70400 W83-70401 W83-70401 W83-70402 W83-70401 W83-70461 Fechniques to W83-70467 on Notification W83-70479 on W83-70479 on W83-70482 on W83-70489 W83-70489 W83-70495 W83-70495 W83-70506 W83-70507 W83-70508 iarth Surveying W83-70510	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon 8 Johnson Space Center, Houston, Toher Selection of Space Selection of Space Center, Houston, Toher Selection of Space Selection of Communication of Space Selection of Space Selection of Space Selection of Space Selection of Space Space Selection of Space Space Selection of Space Space Selection of Space Space Space Selection of Space	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70157 Systems W83-70164 W83-70164 W83-70176 ystems W83-70187 W83-70187 W83-70187 W83-70207 S W83-70207 S W83-70207 S W83-70217 W83-70227 W83-70227 W83-70227	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Viscous Drag Reduction and Control 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics 505-31-33 Aeroacoustics Research 505-31-33 Aeroacoustics Research 505-31-33 Late Prediction for Structural Materials 505-33-13 Life Prediction for Structural Materials 505-33-33 Loads and Aeroelasticity 505-33-33 Loads and Aeroelasticity	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70585 Follow on Study W83-70587 Study W83-70588 W83-70003 W83-70005 W83-70008 W83-70010 W83-70015 W83-70016 W83-70019 W83-70019
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing Tastronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-60-00 Ceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation 676-10-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01 SERIES - Satellite Emission Range Inferred E 676-59-30 Land Cover Multisensor Analysis 677-21-25	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Sechniques to W83-70467 On Notification W83-70479 Int W83-70479 Int W83-70489 W83-70489 W83-70499 W83-70497 W83-70497 W83-70497 W83-70506 W83-70507 W83-70508 Sarth Surveying W83-70511	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toward Mancraft Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-17 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 STS Control and Guidance Technology Deve 506-57-17 Human Factors for Crew Interfaces in Space 506-57-27 Space Station Communication Technology 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-60-17 Automation of Space Transportation System 506-63-31 OEX-Advanced Autopilot 506-63-42 Space Station Operations 506-64-27 Life Support Systems Technology Developm 506-64-37 In-Situ Measurements of Stratospheric Ozor 147-11-05 Planetary Materials Laboratory and Analytic Planetary Materials Laboratory and Analytic	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70134 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 loopment W83-70187 is W83-70187 is W83-70217 W83-70207 s W83-70217 W83-70217 W83-70217 W83-70227 W83-70227 w83-70227 w83-70227 w83-70227 w83-70240 is W83-70240 is W83-70240 is W83-70240 is W83-70240	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental Applied Aerodynamics 505-31-13 Experimental First Techniques 505-31-33 Aeroacoustics Research 505-31-33 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-33 Loads and Aeroelasticity 505-33-33 Advanced Structural Analysis Methods	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70586 Special Flight W83-70587 Study W83-70588 W83-70003 W83-70005 W83-70010 W83-70016 W83-70019 W83-70019 W83-70022 W83-70025 W83-70028
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-75 Asteroids 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-31-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation 676-10-10 Linhospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01 SERIES - Satellite Emission Range Inferred E 676-59-30 Land Cover Multisensor Analysis 677-21-25 Digital Topographic Mapping	W83-70399 W83-70400 W83-70401 W83-70401 W83-70402 W83-70401 W83-70461 Fechniques to W83-70467 on Notification W83-70479 on W83-70479 on W83-70482 on W83-70489 W83-70489 W83-70495 W83-70495 W83-70506 W83-70507 W83-70508 iarth Surveying W83-70510	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Service S	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70187 W83-70187 W83-70187 W83-70192 W83-70204 W83-70207 S W83-70207 S W83-70217 W83-70217 W83-70217 W83-70219 W83-70227 W83-70227 W83-70227 W83-70227 W83-70227 W83-70227 W83-70227 W83-70237 ent W83-70240 W83-70268 W83-70293	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamics 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental/Applied Aerodynamics 505-31-33 Aeroacoustics Research 505-31-33 Experimental Test Techniques 505-31-33 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-33 Loads and Aeroelasticity 505-33-33 Advanced Structural Analysis Methods 505-33-53	W83-70578 W83-70593 W83-70593 W83-70594 stems Ground W83-70585 Special Flight W83-70588 Special Flight W83-70588 W83-70588 W83-70005 W83-70006 W83-70010 W83-70016 W83-70019 W83-70019 W83-70022 W83-70025
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing Tastronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-01 Communications Satellite New Application Studies 643-10-02 Propagation Studies and Measurements 643-10-03 Mobile Satellite Experiment 650-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-60-00 Ceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 672-50-06 Regional Crustal Deformation 676-10-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01 SERIES - Satellite Emission Range Inferred E 676-59-30 Land Cover Multisensor Analysis 677-21-25	W83-70390 W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Sechniques to W83-70467 On Notification W83-70479 Int W83-70479 Int W83-70489 W83-70489 W83-70499 W83-70497 W83-70497 W83-70497 W83-70506 W83-70507 W83-70508 Sarth Surveying W83-70511	Network Monitor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toward Mancraft Fire Safety Materials Testing 505-45-17 Refining of Nonterrestrial Materials 506-53-17 Hypervelocity Impact Resistance of Com 506-53-27 Advanced Carbon-Carbon Panels 506-53-37 Programmable Mask Technology 506-54-17 Multifunction SAR Technology 506-54-17 Automations Technology for Manned Space 506-54-67 Orbital Energy Storage and Power Systems 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 Thermal Management for On-Orbit Energy 506-55-77 STS Control and Guidance Technology Deve 506-57-17 Human Factors for Crew Interfaces in Space 506-57-27 Space Station Communication Technology 506-58-27 Advanced Manned Vehicle Onboard Propuls 506-60-17 Automation of Space Transportation System 506-63-31 OEX-Advanced Autopilot 506-63-42 Space Station Operations 506-64-27 Life Support Systems Technology Developm 506-64-37 In-Situ Measurements of Stratospheric Ozor 147-11-05 Planetary Materials Laboratory and Analytic Planetary Materials Laboratory and Analytic	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70134 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70182 loopment W83-70187 is W83-70187 is W83-70217 W83-70207 s W83-70217 W83-70217 W83-70217 W83-70227 W83-70227 w83-70227 w83-70227 w83-70227 w83-70240 is W83-70240 is W83-70240 is W83-70240 is W83-70240	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-23 Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental Applied Aerodynamics 505-31-13 Experimental First Techniques 505-31-33 Aeroacoustics Research 505-31-33 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-33 Loads and Aeroelasticity 505-33-33 Advanced Structural Analysis Methods	W83-70578 W83-70593 W83-70593 File W83-70584 stems Ground W83-70586 Special Flight W83-70587 Study W83-70588 W83-70003 W83-70005 W83-70010 W83-70016 W83-70019 W83-70019 W83-70022 W83-70025 W83-70028
Planning 188-78-38 Optical Astronomy 196-41-71 Radio Astronomy 196-41-73 Comets 196-41-75 Asteroids 196-41-76 Planetary Infrared Imaging 196-41-77 Solar and Heliospheric Physics Data Analyses 385-38-01 Application of Digital Image Processing T Astronomical Imagery 385-41-01 Spectrum and Orbit Utilization Studies 643-10-02 Communications Satellite New Application Studies 643-10-03 Mobile Satellite Experiment 550-60-00 Oceanic Pilot System 656-13-40 Digital Image Recovery and Data Manageme 656-31-02 SAR Data System Research and Developmer 656-34-00 Oligital Image Recovery and Data Manageme 656-44-03 Planetary Data Network Project 656-80-01 Cloud Properties from Satellite Radiances 672-20-09 Solar Irradiance Rocket Experiment 672-40-08 Climate Research Program Support 676-610-10 Lithospheric Structure and Evolution 676-30-05 GRAVSAT Study 676-40-01 SERIES - Satellite Emission Range Inferred E 676-59-30 Land Cover Multisensor Analysis 677-21-25 Digital Topographic Mapping	W83-70399 W83-70400 W83-70401 W83-70402 W83-70401 W83-70461 Fechniques to W83-70462 W83-70469 W83-70479 nt W83-70479 nt W83-70489 W83-70489 W83-70495 W83-70495 W83-70506 W83-70506 W83-70507 W83-70508 Farth Surveying W83-70511 W83-705114 Mission	Network Monntor and Control Technology 310-30-69 High-Speed Signal Processing Research 310-30-70 Network Software Design Technology 310-40-72 Lyndon B Johnson Space Center, Houston, Toher Space Spa	W83-70569 W83-70576 W83-70576 W83-70576 W83-70130 posite Materials W83-70134 W83-70138 W83-70152 W83-70157 Systems W83-70164 W83-70164 W83-70187 W83-70187 W83-70187 W83-70192 W83-70207 S W83-70219 W83-70217 W83-70219 W83-70227 W83-70227 W83-70227 ent W83-70240 e W83-70268 W83-70294 de W83-70294	Manned Facilities 906-54-00 Advanced Transportation 906-63-00 Orbital Services 906-75-00 Advanced Concepts 906-80-00 K John F Kennedy Space Center, Cocoa Beach, Space Operations Study Follow on 906-64-20 Advanced Space Transportation Sys Operations 906-64-21 Space Station Ground Operations Study F 906-64-22 Ground Operations Associated with Demonstrations 906-64-23 Orbital Transfer Vehicle Ground Operations 906-64-24 L Langley Research Center, Hampton, Va Computational and Analytical Fluid Dynamic 505-31-03 Viscous Drag Reduction and Control 505-31-13 Experimental / Applied Aerodynamics 505-31-13 Aeroacoustics Research 505-31-33 Experimental Test Techniques 505-31-33 Mathematics for Engineering and Science 505-31-83 Advanced Structural Alloys 505-33-13 Life Prediction for Structural Materials 505-33-33 Loads and Aeroelasticity 505-33-33 Advanced Structural Analysis Methods 505-33-53 Aucraft Controls Theory and Applications	W83-70583 W83-70593 W83-70593 File W83-70584 sterms Ground W83-70585 Follow on Study W83-70586 Special Flight W83-70588 W83-70588 Second Flight W83-70588 W83-70003 W83-70005 W83-70006 W83-70016 W83-70016 W83-70019 W83-70019 W83-70025 W83-70028

Lewis nesearch Center, Cleveland,	J1110.
Advanced Navigation Guidance and Contro 505-34-13 AIRLAB Operations	rts Technology W83-70034
505-34-23 Community Response to Noise	W83-70035
505-35-13 Crew Cockpit Interface Technology	W83-70037
505-35-23	W83-70039
Flight Simulation Technology 505-35-33	W82-70041
Fund for Independent Research (Aeronautics) 505-36-13	W83-70044
Graduate Program in Aeronautics 505-36-23	W83-70047
JIAFs Base Support 505-36-43	W83-70048
Computer-Aided Design 505-37-13	w83-70050
Rotorcraft Airframe Systems 505-42-23	W83-70065
High Performance Aircraft Flight Dynamics & 505-43-13 High-Speed Aerodynamics and Propulsion Inte	W83-70071
505-43-23 Interagency and Industrial Assistance and Tes	W83-70073
505-43-33 Supersonic Aerodynamics Configurations	W83-70076
Structures & Materials Technology 505-43-43	W83-70078
High Speed (Super/Hypersonic) Technology 505-43-83	W83-70082
Aviation Safety Severe Storm Hazards 505-45-03	W83-70085
Aircraft Landing Dynamics 505-45-23	W83-70092
Aerodynamics/Propulsion Integration 505-45-43	W83-70093
Rotorcraft Vibration and Noise 532-06-13	W83-70098
F-4 Spanwise Blowing 533-02-33	W83-70104
Decoupler Pylon Flight Demonstration 533-02-73	W83-70110
Forward Swept Wing Support 533-02-83	W83-70112
Structural Integration 534-03-13	W83-70116
Advanced Transport Operating Systems 534-04-13 Entry Vehicle Aerothermodynamics	W83-70118
506-51-13 Detailed Aerothermal Loads	W83-70124
506-51-23 Composites for Advanced Space Systems	W83-70125
506-53-23 Thermal Protection Systems for Earth-To-Orbit 506-53-33	W83-70131 STS W83-70137
Advanced Space Structures 506-53-43	W83-70140
Analysis and Design 506-53-53	W83-70143
Solid State & Optical Device Research 506-54-13	W83-70149
High Resolution Laser Research 506-54-23	W83-70154
Automation Systems Research 506-54-63	W83-70161
Advanced Radiant Energy Conversion 506-55-13 Solar Cell Research	W83-70166
506-55-43 Spacecraft Controls and Guidance	W83-70171
506-57-13 Manned Control of Remote Operations	W83-70185
506-57-23 Data Systems Research and Technology	W83-70190
506-58-13 Multiple Beam Antenna Technology Developn	W83-70196 nent Program
for Large Aperture Deployable Reflectors 506-58-23	W83-70201
Advanced Large Spacecraft Systems Analysis 506-62-23	W83-70213
Technology Requirements for Advanced Space T Systems	
506-63-23 Shuttle Entry Air Data System (SEADS)	W83-70216
506-63-32 Shuttle Infrared Leeside Temperature Sensing	
506-63-34 Shuttle Upper Atmosphere Mass Spectron	
506-63-37 High Resolution Accelerometer Package (HiRAI	W83-70224 P) Experiment
Development 506-63-43 Technology Systems Analysis Across Dis	W83-70228 sciplines for
Permanently Orbiting Space Stations 506-64-13	W83-70230
Teleoperator and Robotics System Analysis 506-64-23	W83-70234
FILE Flight ExperimentsAnalysis and Support 542-03-14	W83-70243
Crystal Growth in Space 542-03-30	W83-70246
Low Duration Exposure Facility 542-04-13	W83-70247
Meteorological Lidar Development 146-74-01	W83-70263
Crystal Growth Research 179-80-70	W83-70369
Radiation Effects and Protection 199-20-76	W83-70426

Superhan Annahan Intersetions in Wotle	nd Ecocustoms
Biosphere-Atmosphere Interactions in Wetlan 199-30-36	W83-70431
System Analysis and Evaluation of Perman Orbiting Space Facilities	
906-54-20 Lewis Research Center, Cleveland, Ohio	W83-70579
Computational Fluid Dynamics for Turbomach 505-31-02	W83-70002
Fluid Mechanics of Turbomachinery/Lewis 505-31-32	W83-70009
Burning Fundamentals & Heat Transfer 505-31-42	W83-70012
Propulsion Instrumentation 505-31-52	W83-70014
High Temperature Materials 505-33-12	W83-70018
Life Prediction for Engine Materials 505-33-22	W83-70021
High Temperature Engine Composites 505-33-32	W83-70024
Engine Dynamics and Aeroelasticity 505-33-42	W83-70027
Control Theory and Methodology 505-34-02	W83-70031
Fund for Independent Research (Aeronautics) 505-36-12	W83-70043
Graduate Program in Aeronautics 505-36-22	W83-70046
Computational Facilities 505-37-32 ,	W83-70054
Inlets and Nozzles 505-40-02	W83-70055
Fan and Compressor Research 505-40-12	W83-70056
Combustors and Turbines 505-40-22	W83-70057
Propeller Research 505-40-32	W83-70058
Power Transfer Research 505-40-42	W83-70059
Controls and Instrumentation 505-40-52	W83-70060
Engine Systems Research 505-40-62	W83-70061
Engine Systems Facilities Operations 505-40-70	W83-70062
Wind Tunnel Operations 505-40-72	W83-70063
Rotorcraft-Operating Problems	W83-70066
Powered Lift Propulsion Technology	W83-70069
Non-Axisymmetric Nozzle Research	W83-70072
505-43-22 Interagency & Industrial Assistance & Testing	W83-70075
505-43-32 Supersonic Propulsion Integration Technology	W83-70077
505-43-42 Hypersonic Propulsion Integration Technology	W83-70077
505-43-82 Aircraft Icing Research	
505-45-02 Aircraft Fuel Efficiency Improvement	W83-70084 W83-70091
505-45-22 Convertible Engine System Technology	W83-70097
532-06-12 Turbine Engine Hot Section Technology (HOS	T)
533-04-12 Energy Efficient Engine Project	W83-70115
535-01-12 Advanced Turboprop Program	W83-70120
535-03-12 Non-Destructive Evaluation and Tribology	W83-70122
506-53-12 Submillimeter & Optical Processing Device Re	
508-54-12 Advanced Concepts in Energy Conversion	W83-70148
506-55-12 Electric Propulsion Technology	W83-70165
506-55-22 Photovoltaic Research and Technology	W83-70168
506-55-42 Electrochemical Energy Conversion and Storag	W83-70170
506-55-52 Power Systems Management and Distribution	W83-70174
506-55-72 Satellite Communications Research and Techn	
506-58-22 Earth-to-Orbit Propulsion Life and Performance	
506-60-12 Variable Thrust OTV Propulsion Technology	W83-70206
506-60-42 Space Station Propulsion Requirements	W83-70210
506-64-12 Platform Systems Operations	W83-70229
506-64-22 Flight Test of an Ion Auxiliary Propulsion S	
542-05-12 Reduced Gravity Combustion Science	W83-70248
179-80-51 Technical Consultation Services	W83-70366
643-10-01 New Application Studies	W83-70466
643-10-02 Experiment Coordination and Mission Support	W83-70468
646-41-01 Space Communications Systems Antenna Tec	W83-70471
650-60-20 Satellite Switching and Processing Systems	W83-70474
650-60-21 RF Components for Satellite Communications	W83-70475 Systems
650-60-22	W83-70476

Communications Laboratory for and Satellite Network Evaluation	or Transpond	der Development
650-60-23 Advanced Communications	Technology	W83-70477 Satellite (ACTS)
System Studies 650-60-26		W83-70478

M

Marshall Space Flight Center, Huntsville, Ala
Safety - Atmospheric Processes
505-45-09 W83-70087 Space Durable Composites and Thermal Control Surfaces
506-53-29 W83-70135 Space Vehicle Structural Dynamic Analysis and Synthesis
Methods 506-53-59 W83-70146
Multi-KW Solar Arrays 506-55-49 W83-70173
Multi-100 kW Low Cost Earth Orbital Systems 506-55-79 W83-70183
Large Space Systems Technology Control and Guidance 506-57-19 W83-70188
Teleoperator and EVA Human Factors 506-57-29 W83-70193
On-line Data Ingest/Staging System 506-58-19 W83-70199
Reusable High Pressure Main Engine Technology 506-60-19 W83-70208
OTV Propulsion Performance and Plume Characterization 506-60-49 W83-70211
Solar Array Flight Experiment (SAFE) Dynamics & Control
Augmentation (Flights 1 and 2) 506-62-49 W83-70215
Conceptual Characterization and Technology Assessment 506-63-29 W83-70218
Platform Systems Study 506-64-19 W83-70232
Teleoperations and Cryogenic Fluid Management 506-64-29 W83-70238
Shuttle Operational Flight Test of a Large Solar Array 542-03-04 W83-70242
Tribological Experiments in Zero Gravity 542-03-27 W83-70245
Meteorological Satellite Data Research and Applications 146-61-00 W83-70252
Meteorological Observing System Development 146-73-00 W83-70262
Studies of Dynamics of Atmospheric Flows 146-76-00 W83-70264
Orbiting VLBI Feasibility Study 159-41-03 W83-70330
Advanced X-Ray Astrophysics Facility (AXAF) 159-46-01 W83-70331
Development of New Remote Data Interpretation Techniques
175-20-00 W83-70347 Remote Sensor Development
175-40-00 W83-70348 MPS AR&DA Support
179-40-62 W83-70360 Commercial Materials Processing in Low-Gravity
179-60-62 W83-70362 Cloud Physics
179-75-10 W83-70363 Containerless Processing
179-80-30 W83-70364 Bioseparation Processes
179-80-40 W83-70365 Solidification Processes
179-80-60 W83-70367 Crystal Growth Processes
179-80-70 W83-70368 Development of Experiments and Hardware for Solar Physics
Research 188-38-51 W83-70370
Ground-Based Observations of the Sun 188-38-52 W83-70373
Structure and evolution of Solar Magnetic Fields (Laboratory & Theory for Solar Physics)
188-38-53 W83-70375 Ground-Based Observations UV and Optical Astronomy
188-41-21 W83-70377 Gamma Ray Astronomy and Related Research
188-46-57 W83-70384 X-Ray Astronomy
188-46-59 W83-70388 Advanced Mission Study - Solar X-Ray Pinhole Satellite and
Long Focal Length Coronagraph 188-78-38 W83-70391
Gravity Probe - B 188-78-41 W83-70392
Life Sciences Payload Accommodations 199-80-48 W83-70453
Space Plasma Data Analysis
385-36-01 W83-70458 Data Analysis 385-38-01 W83-70459
Mass Storage Network R&D
Superconducting Gravity Gradiometer
676-59-33 W83-70511 Shuttle Time and Frequency Transfer Experiment (STIFT)
676-59-41 W83-70512 Space Platform Specification Development
906-50-00 W83-70577 Structural Assembly Demonstration Experiment (SADE)
906-55-00 W83-70580 Manned Facilities (Space Station)
906-58-00 W83-70581

High Energy Upper Stage
906-63-00 W83-70582
Advanced Transportation Shuttle Derived Vehicles (SDV)
906-65-00 W83-70589
Tethered Satellite System (TSS) (System Development)
906-70-00 W83-70590
Teleoperator Maneuvering System
906-75-00 W83-70591
Deployable Antenna Flight Experiment
906-90-00 W83-70594
Geostationary Platform Bus Definition
906-90-03 W83-70595

N

National Aeronautics and Space Administration	•
Washington, D C Research in Advanced Material Concepts for	or Aaronautice
505-33-10	W83-70017
Aerospace Computer Science University Rese	
505-37-20	W83-70051
Radio Technical Commission for Aeronautics	
534-04-10	W83-70117
Advanced Space Structural Concepts	W03-70117
506-53-40	W83-70139
Space Computer Science University Research	
506-54-50	W83-70158
	W03-70150
Space Energy Conversion Support 506-55-70	W83-70178
Multidisciplinary Research	W03-70176
506-56-20	W83-70184
Archival Mass Memory	W03-70104
506-58-10	W83-70194
Chemical Propulsion R&T Interagency Suppor	
506-60-10	W83-70205
National Space Technology Labs, Bay Saint	
Advanced Technology Global Resources Net	
656-44-06	W83-70485
Multisensor Technique Development	1100 70403
677-21-28	W83-70516
Land Resources Applied Research	******
677-21-29	W83-70517
Hydrothermal Ore System Detection in Partia	
Mountainous Terrain	my vegerated
677-41-13	W83-70530
Use of TM for the Detection of Mineralization	
Terrain Through Inference of Geobotanical Parai	
677-42-04	W83-70536
*** · ** **	

Page Intentionally Left Blank

RTOP NUMBER INDEX

RTOP Summary

FISCAL YEAR 1983

Typical RTOP Number Index Listing



This section may be used to identify the RTOP accession number of reports covered in this journal. Thus this section of this index may be used to locate the bibliographic citations and technical summaries in the Summary Section. The RTOP numbers are listed in ascending number order.

159-41-03 159-46-01 161-10-00 161-10-01

161-10-03 161-20-00 161-20-07

161-20-10

summanes in the Summary Section.		161-20-11
numbers are listed in ascending number	er order.	161-30-00
		161-30-01
		161-30-05
		161-40-00
146-10-04	W83-70249	161-40-02
146-20-10	W83-70250	161-50-00
146-60-00	W83-70251	161-50-02
146-61-00	W83-70252	175-13-00
146-64-00	W83-70253	175-20-00
146-65-00	W83-70254	175-40-00
146-66-01	W83-70255	176-10-00
146-70-00	W83-70256	
146-71-00	W83-70257	176-30-01
146-72-01	W83-70258	176-40-03
146-72-02	W83-70259	179-11-20
146-72-04	W83-70260	179-13-72
146-72-05	W83-70261	179-15-20
146-73-00	W83-70262	179-20-55
146-74-01	W83-70263	179-20-56
146-76-00	W83-70264	179-20-57
147-10-03	W83-70265	179-40-62
147-11-00	W83-70266	
147-11-04	W83-70267	179-46-20
147-11-05	W83-70268	179-60-62
147-12-00	W83-70269	179-75-10
147-12-05	W83-70270	179-80-30
147-12-06	W83-70271	179-80-40
147-12-08	W83-70272	179-80-51
147-15-00	W83-70273	179-80-60
147-16-01	W83-70274	179-80-70
147-18-02	W83-70275	173-00-70
147-20-03	W83-70276	188-38-51
147-20-03	W83-70276 W83-70277	100-30-31
147-21-03	W83-70278	188-38-52
147-22-01 147-23-00	W83-70279 W83-70280	180-38-52
	W83-70281	188-38-53
147-23-08	W83-70281 W83-70282	100-30-53
147-23-09		
147-23-10 147-30-02	W83-70283 W83-70284	188-41-21 188-41-22
147-31-00	W83-70285	188-41-24
147-32-00	W83-70286	188-41-51
147-41-00	W83-70287	188-41-53
147-43-00	W83-70288	188-41-55
147-44-00	W83-70289	188-46-56
147-51-00	W83-70290	188-46-57
147-51-02	W83-70291	
151-01-70	W83-70292	
152-01-40	W83-70293	188-46-59
152-02-40	W83-70294	
152-03-60	W83-70295	
152-04-40	W83-70296	188-78-38
152-05-40	W83-70297	
153-01-60	W83-70298	188-78-41
153-02-40	W83-70299	188-78-51
153-02-70	W83-70300	196-41-50
153-03-50	W83-70301	196-41-52
153-06-40	W83-70302	196-41-54
153-07-40	W83-70303	196-41-67
153-08-40	W83-70304	196-41-68
153-08-50	W83-70305	196-41-71
153-09-40	W83-70306	196-41-73
153-10-40	W83-70307	196-41-75
154-10-80	W83-70308	196-41-76
154-20-80	W83-70309	196-41-77
	W83-70310	199-10-00
154-30-80	W83-70311	199-10-11
154-40-80	W83-70312	199-10-12
154-50-80	W83-70313	199-10-21
154-60-80	W83-70314	199-10-22
154-75-80	W83-70315	199-10-31
154-80-80	W83-70316	199-10-32
	W83-70317	199-10-41
156-02-02	W83-70318	199-20-11
156-03-01	W83-70319	199-20-12
156-03-02	W83-70320	199-20-21
156-03-03	W83-70321	199-20-22
156-03-04	W83-70322	199-20-31
156-03-07	W83-70323	199-20-32
157-03-50	W83-70324	199-20-41
157-04-80	W83-70325	199-20-42
	W83-70326	199-20-51
	W83-70327	199-20-52
157-05-50	W83-70328	199-20-61
157-20-70	W83-70329	199-20-62

W83-70330 W83-70331 W83-70332 W83-70333 W83-70333 W83-70335 W83-70335 W83-70335 W83-70337 W83-70338 W83-70340 W83-70341 W83-70344 W83-70344 W83-70345 W83-70347 W83-70345 W83-70345 W83-70355 W83-70355 W83-70350 W83-70360 W83-70360 W83-70360 W83-70360 W83-70360 W83-70370 W83-70380	199-20-71 199-20-72 199-20-82 199-20-82 199-20-82 199-30-31 199-30-31 199-30-31 199-30-31 199-50-12 199-50-12 199-50-62 199-50-62 199-50-62 199-50-62 199-60-11 199-60-12 199-60-12 199-60-22 199-60-21 199-60-22 199-60-21 199-60-31 199-60-31 199-80-32 199-80-31 199-80-32 199-80-31 199-80-31 199-80-32 199-80-31 199-80-31 199-80-32 199-80-31 199-80-33 10-10-60 310-10-63 310-10-62 310-10-63 310-10-63 310-20-38 310-20-38 310-20-38 310-20-38 310-20-46 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-20-66 310-30-69 310-30-69 310-30-70 310-40-40 310-40-40 310-40-47 310-40-47 310-40-48 310-40-47 310-40-48 310-40-49
W83-70394 W83-70395 W83-70396 W83-70399 W83-70399 W83-70400 W83-70401 W83-70402 W83-70404 W83-70405 W83-70407 W83-70407 W83-70409 W83-70410 W83-70410	405-02-02 505-31-01 505-31-02 505-31-02 505-31-11 505-31-15 505-31-21 505-31-23 505-31-32 505-31-32 505-31-41 505-31-41 505-31-42 505-31-51 505-31-51 505-31-53 505-31-53 505-31-53 505-31-83 505-33-183 505-33-183
W83-70413 W83-70414 W83-70415 W83-70416 W83-70417 W83-70418 W83-70419 W83-70420 W83-70421 W83-70422 W83-70423	505-33-13 505-33-21 505-33-22 505-33-33 505-33-33 505-33-33 505-33-41 505-33-42 505-33-43 505-33-53

W83-70424
W83-70426
W83-70428
W83-70429
W83-70431
W83-70431
W83-70433
W83-70436
W83-70436
W83-70436
W83-70436
W83-70436
W83-70441
W83-70441
W83-70441
W83-70446
W83-70446
W83-70456
W83-70566
W33-70566
W33-70566
W33-70566
W33-70566
W33-70566
W33-70566 W83-70005
W83-70006
W83-70007
W83-70009
W83-70010
W83-70011
W83-70011
W83-70011
W83-70015
W83-70016
W83-70017
W83-70018
W83-70018
W83-70018
W83-70018 W83-70019 W83-70020 W83-70021 W83-70022 W83-70023 W83-70025 W83-70026 W83-70027 W83-70028 W83-70029

RTOP NUMBER INDEX

			RIOP NOWBER INDEX		
505-34-01	W83-70030	506-55-43	W83-70171	646-41-01	W83-70471
505-34-02	W83-70031	506-55-45	W83-70172	646-41-02	W83-70472
505-34-03	W83-70032	506-55-49	W83-70173	650-60-00 650-60-20	W83-70473 W83-70474
505-34-11	W83-70033	506-55-52 506-55-55	W83-70174 W83-70175	650-60-20 650-60-21	W83-70474 W83-70475
505-34-13	W83-70034	506-55-57	W83-70176	650-60-22	W83-70476
505-34-23 505-35-01	W83-70035 W83-70036	506-55-65	W83-70177	650-60-23	W83-70477
505-35-13	W83-70037	506-55-70	W83-70178 W83-70179	650-60-26 656-13-40	W83-70478 W83-70479
505-35-21	W83-70038	506-55-72 506-55-75	W83-70179 W83-70180	656-26-02	W83-70480
505-35-23	W83-70039	506-55-76	W83-70181	656-30-01	W83-70481
505-35-31 505-35-33	W83-70040 W83-70041	506-55-77	W83-70182	656-31-02	W83-70482
505-36-11	W83-70041	506-55-79	W83-70183	656-42-01 656-44-03	W83-70483 W83-70484
505-36-12	W83-70043	506-56-20 506-57-13	W83-70184 W83-70185	656-44-06	W83-70464 W83-70485
505-36-13	W83-70044	506-57-15	W83-70186	656-44-10	W83-70486
505-36-21 505-36-22	W83-70045 W83-70046	506-57-17	W83-70187	656-50-01	W83-70487
505-36-22	W83-70046 W83-70047	506-57-19 506-57-21	. W83-70188 W83-70189	656-60-10 656-80-01	W83-70488 W83-70489
505-36-43	W83-70048	506-57-23	W83-70189 W83-70190	656-85-01	W83-70490
505-37-01	W83-70049	506-57-25	W83-70191	656-90-01	W83-70491
505-37-13 505-37-20	W83-70050 W83-70051	506-57-27	W83-70192	672-20-09	W83-70492 W83-70493
505-37-21	W83-70052	506-57-29 506-58-10	W83-70193 W83-70194	672-30-00 672-40-00	W83-70493 W83-70494
505-37-31	W83-70053	506-58-11	W83-70195	672-40-08	W83-70495
505-37-32	W83-70054	506-58-13	W83-70196	672-50-00	W83-70496
505-40-02 505-40-12	W83-70055 W83-70056	506-58-15	W83-70197	672-50-06	W83-70497 W83-70498
505-40-22	W83-70057	506-58-16 506-58-19	W83-70198 W83-70199	673-11-00 673-13-00	W83-70499
505-40-32	W83-70058	506-58-22	W83-70200	673-14-00	W83-70500
505-40-42 505-40-52	W83-70059 W83-70060	506-58-23	W83-70201	673-15-00	W83-70501
505-40-52	W83-70061	506-58-25	W83-70202 W83-70203	673-18-00 673-31-00	W83-70502 W83-70503
505-40-70	W83-70062	506-58-26 506-58-27	W83-70203 W83-70204	673-41-00	W83-70504
505-40-72	W83-70063	506-60-10	W83-70205	676-01-01	W83-70505
505-42-11 505-42-23	W83-70064 W83-70065	506-60-12	W83-70206	676-10-10	W83-70506
505-42-23 505-42-32	W83-70066	506-60-17 506-60-19	W83-70207 W83-70208	676-30-05 676-40-01	W83-70507 W83-70508
505-42-81	W83-70067	506-60-19	W83-70206 W83-70209	676-59-10	W83-70509
505-43-01	W83-70068	506-60-42	W83-70210	676-59-30	W83-70510
505-43-02 505-43-11	W83-70069 W83-70070	506-60-49 506-62-21	W83-70211 W83-70212	676-59-33 676-59-41	W83-70511 W83-70512
505-43-13	W83-70071	506-62-23	W83-70212 W83-70213	677-21-24	W83-70512
505-43-22	W83-70072	506-62-25	W83-70214	677-21-25	W83-70514
505-43-23 505-43-31	W83-70073 W83-70074	506-62-49	W83-70215	677-21-26	W83-70515
505-43-32	W83-70075	506-63-23 506-63-27	W83-70216 W83-70217	677-21-28 677-21-29	W83-70516 W83-70517
505-43-33	W83-70076	506-63-29	W83-70218	677-21-30	W83-70518
505-43-42 505-43-43	W83-70077 W83-70078	506-63-31	W83-70219	677-22-27	W83-70519
505-43-61	W83-70078	506-63-32 506-63-34	W83-70220 W83-70221	677-27-01 677-29-05	W83-70520 W83-70521
505-43-81	W83-70080	506-63-35	W83-70221 W83-70222	677-29-12	W83-70522
505-43-82	W83-70081	506-63-36	W83-70223		W83-70523
505-43-83 505-45-01	W83-70082 W83-70083	506-63-37	W83-70224	677-29-14	W83-70524
505-45-02	W83-70084	506-63-39 506-63-40	W83-70225 W83-70226	677-29-17 677-29-18	W83-70525 W83-70526
505-45-03	W83-70085	506-63-42	W83-70227	677-29-22	W83-70527
505-45-05	W83-70086	506-63-43	W83-70228	677-29-23	W83-70528
505-45-09 505-45-11	W83-70087 W83-70088	506-64-12	W83-70229	677-41-03 677-41-13	W83-70529 W83-70530
505-45-15	W83-70089	506-64-13 506-64-15	W83-70230 W83-70231	677-41-13	W83-70531
505-45-17	W83-70090	506-64-19	W83-70232	677-41-16	W83-70532
505-45-22 505-45-23	W83-70091 W83-70092	506-64-22	W83-70233	677-41-17	W83-70533
505-45-43	W83-70093	506-64-23 506-64-25	W83-70234 W83-70235	677-41-19 677-41-23	W83-70534 W83-70535
506-51-11	W83-70123	506-64-26	W83-70236	677-42-04	W83-70536
506-51-13	W83-70124 W83-70125	506-64-27	W83-70237	677-42-05	W83-70537
506-51-23 506-51-41	W83-70126	506-64-29	W83-70238 W83-70239	677-42-07 677-43-16	W83-70538 W83-70539
506-53-11	W83-70127	506-64-31 506-64-37	W83-70239 W83-70240	677-43-10	W83-70539 W83-70540
506-53-12	W83-70128	532-01-11	W83-70094	677-43-18	W83-70541
506-53-15 506-53-17	W83-70129 W83-70130	532-03-11	W83-70095	677-45-06	W83-70542
506-53-17	W83-70131	532-06-11 532-06-12	W83-70096 W83-70097	677-46-02 677-47-03	W83-70543 W83-70544
506-53-25	W83-70132	532-06-13	W83-70098	677-48-01	W83-70545
506-53-26 506-53-27	W83-70133 W83-70134	532-07-11	W83-70099	677-48-03	W83-70546
506-53-27 506-53-29	W83-70134 W83-70135	532-08-11 533-02-11	W83-70100 W83-70101	677-60-11 677-60-15	W83-70547 W83-70548
506-53-31	W83-70136	533-02-11	W83-70101 W83-70102	677-60-19	W83-70549
506-53-33 506-53-37	W83-70137	533-02-31	W83-70103	677-80-22	W83-70550
506-53-37 506-53-40	W83-70138 W83-70139	533-02-33	W83-70104 W83-70105	879-11-38 879-11-41	W83-70551 W83-70552
506-53-43	W83-70140	533-02-41 533-02-50	W83-70105 W83-70106	879-11-41 879-11-46	W83-70552 W83-70553
506-53-45	W83-70141	533-02-51	W83-70107	906-50-00	W83-70577
506-53-51 506-53-53	W83-70142 W83-70143	533-02-61	W83-70108	906-54-00	W83-70578
506-53-55	W83-70143	533-02-71 533-02-73	W83-70109 9 W83-70110	906-54-20 906-55-00	W83-70579 W83-70580
506-53-56	W83-70145	533-02-73	W83-70111 W83-70111	906-58-00	W83-70581
506-53-59 506-54-11	W83-70146	533-02-83	W83-70112	906-63-00	W83-70582
506-54-11 506-54-12	W83-70147 W83-70148	533-02-91	W83-70113 W83-70114	906-64-20	W83-70583 W83-70584
506-54-13	W83-70149	533-03-11 533-04-12	. W83-70114 . W83-70115	906-64-20	W83-70584 W83-70585
506-54-15	W83-70150	534-03-13	W83-70116	906-64-22	W83-70586
506-54-16 506-54-17	W83-70151 W83-70152	534-04-10	W83-70117	906-64-23	W83-70587
506-54-17	W83-70152 W83-70153	534-04-13 534-04-16	W83-70118 W83-70119	906-64-24 906-65-00	W83-70588 W83-70589
506-54-23	W83-70154	535-01-12	W83-70120	906-70-00	W83-70590
506-54-25 506-54-26	W83-70155	535-03-11	W83-70121	906-75-00	W83-70591
506-54-26 506-54-27	W83-70156 W83-70157	535-03-12	W83-70122	906 80 00	W83-70592 W83-70593
506-54-50	W83-70158	542-03-01 542-03-04	W83-70241 W83-70242	906-80-00 906-90-00	W83-70593 W83-70594
506-54-56	W83-70159	542-03-14	W83-70243	906-90-03	W83-70595
506-54-61 506-54-63	W83-70160 W83-70161	542-03-20	W83-70244		
506-54-65	W83-70161	542-03-27 542-03-30	W83-70245 W83-70246		
506-54-66	W83-70163	542-04-13	W83-70246 W83-70247		
506-54-67 506-55-12	W83-70164 W83-70165	542-05-12	W83-70248	i	
506-55-12 506-55-13	W83-70165 W83-70166	643-10-01	W83-70466		
506-55-15	W83-70167	643-10-02	W83-70467 W83-70468	_	
506-55-22	W83-70168	0-3-10-02	W83-70469	I	
506-55-25 506-55-42	W83-70169 W83-70170	643-10-03	W83-70470	I	
					NASA-Langley, 198
1-56					NASA-Langley, 190

National Aeronautics and Space Administration

THIRD-CLASS BULK RATE

Postage and Fees Paid National Aeronautics and Space Administration NASA-451



Washington, D.C. 20546

Official Business
Penalty for Private Use, \$300

10 1 RTOP, 830127 S10333ASR850609 NASA SCIEN & TECH INFO FACILITY ATTN: DOCUMENT SUPPLY-CLASSIFIED P O BOX 8757 BWI ARPRT BALTIMORE MD 21240



POSTMASTER:

If Undeliverable (Section 158 Postal Manual) Do Not Return